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Science & Technology

Japan

STA 1992: ITS ROLES AND ACTIVITIES

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SCIENCE & TECHNOLOGY

STA: 1992: ITS ROLE AND ACTIVITIES

JAPAN

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CONTENTS

ROLE OF THE SCIENCE AND TECHNOLOGY AGENCY

Comprehensive Promotion of Science and Technology Administration

Major Responsibilities of the Science and Technology Agency

Nowadays, science and technology play major roles in our life, in the nation's economic activities, as well as in the international community. Consequently, it is especially important that national science and technology policy be well coordinated.

To fulfill this mission, STA coordinates science and technology policy in Japan and assumes the specific responsibilities mentioned below.

(1) **Plan, formulate, and implement basic science and technology policies.**

The agency sets the direction of Japan's science and technology policy and constructs research and development programs in each major field of research. It also oversees various institutions and establishes guidelines to implement science and technology policy in Japan.

(2) **Coordinate the administration and budget estimation of science and technology activities.**

To achieve harmony among the policies and administrative activities of the various ministries executing science and technology policy, the agency coordinates the programs of the individual ministries and draws up basic guidelines for adjudicating each ministry's science and technology budget.

(3) **Encourage science and technology contributions in the international arena.**

To contribute to the international community, STA is aggressively supporting joint international research, personnel exchanges between Japanese and foreign research institutions, information exchange, and other activities.

(4) **Promote creative and fundamental research.**

STA is establishing and administering fundamental research institutions, the results of which will be the common property of mankind and the seeds for creative future technology.

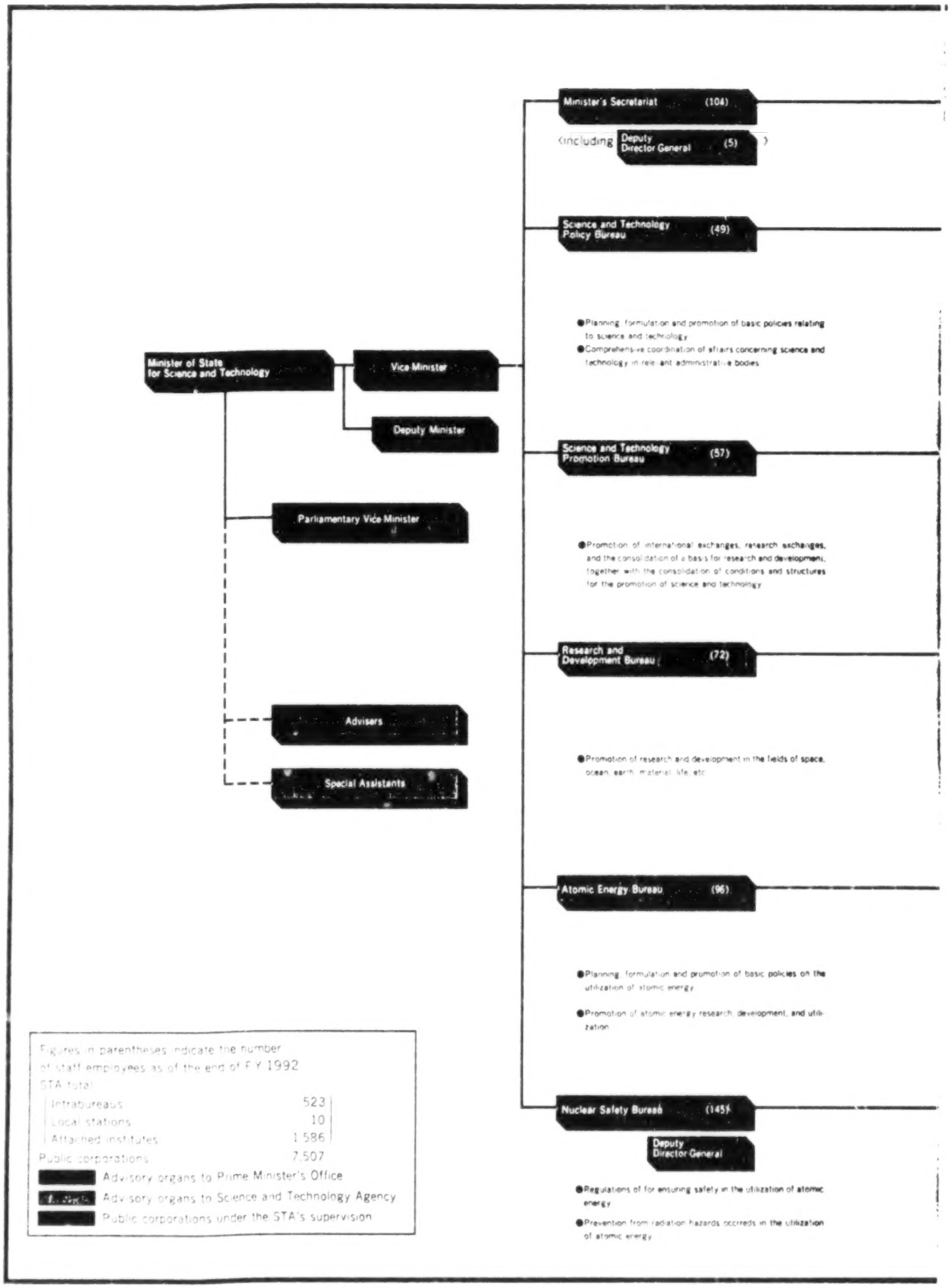
(5) **Improve the research and development infrastructure.**

The Science and Technology Agency has been establishing core facilities for research and development, including a large-scale synchrotron radiation facility to be used jointly by both Japanese and foreign researchers. STA also is disseminating information on science and technology and is encouraging the exchange of research results among industry, academia, and government.

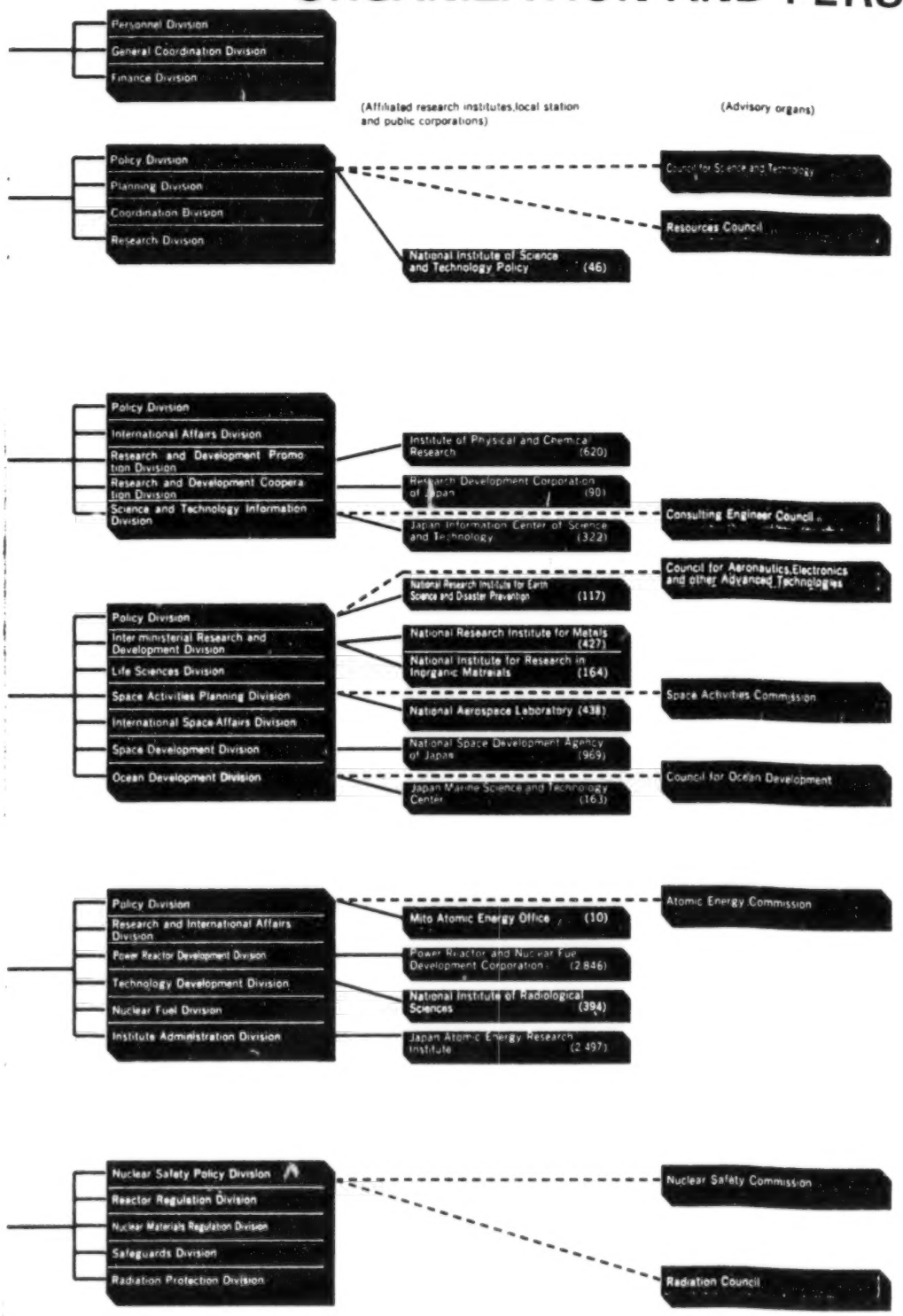
(6) **Promote large scale R&D projects nationally, and promote inter-ministry R&D.**

STA promotes large scale projects, including the use of atomic energy, and pioneering projects in space and ocean development. It also conducts R&D at national research centers and at public corporations under its jurisdiction, in fields such as earth science, disaster prevention, materials science, life sciences, and aeronautical technology.

In addition, STA enforces atomic energy safety measures, regulates the development and use of atomic energy, and helps protect against hazards in the use of atomic energy. The Agency also investigates resource use and analyzes science and technology trends both in Japan and overseas. It also is the responsibility of the Science and Technology Agency to serve as the secretarial office of the various advisory bodies of the Prime Minister's office, the Council for Science and Technology (the supreme advisory body for science and technology in Japan), the Atomic Energy Commission, the Nuclear Safety Commission, the Space Activities Commission, and the Council for Ocean Development.


Minister's Secretariat (104)
(including Deputy Director General (5))
Science and Technology Policy Bureau (49)
●Planning, formulation and promotion of basic policies relating to science and technology
●Comprehensive coordination of affairs concerning science and technology in relevant administrative bodies
Minister of State for Science and Technology
Vice-Minister
Deputy Minister
Science and Technology Promotion Bureau (57)
●Promotion of international exchanges, research exchanges, and the consolidation of a basis for research and development, together with the consolidation of conditions and structures for the promotion of science and technology
Parliamentary Vice-Minister
Research and Development Bureau (72)
●Promotion of research and development in the fields of space, ocean, earth, material, life, etc.
Advisers
Special Assistants
Atomic Energy Bureau (96)
●Planning, formulation and promotion of basic policies on the utilization of atomic energy
●Promotion of atomic energy research, development, and utilization
Nuclear Safety Bureau (145)
Deputy Director General
●Regulations of for ensuring safety in the utilization of atomic energy
●Prevention from radiation hazards occrreds in the utilization of atomic energy
Figures in parentheses indicate the number of staff employees as of the end of F.Y. 1992.
STA total
Intrabureaus 523
Local stations 10
Attached institutes 1,586
Public corporations 7,507
Advisory organs to Prime Minister's Office
Advisory organs to Science and Technology Agency
Public corporations under the STA's supervision

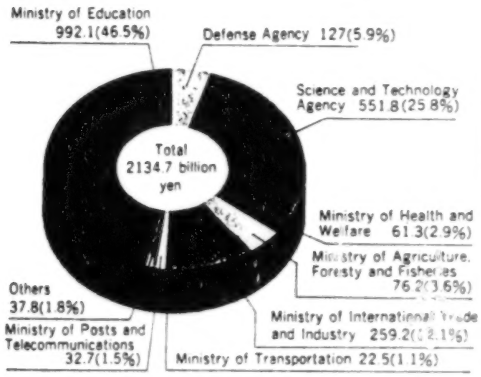
ORGANIZATION AND PERSONNEL



STA Budget for FY 1992

The budget of the Science and Technology Agency (STA) for the fiscal 1992 totals 551.8 billion yen, 25.8% of the total government budget for science and technology.

FY 1992 Budget for Science and Technology by Ministries and Agencies



Unit : Billion yen; the figures in parentheses show the percentages of the total amount.

Note : 26.0 billion yen, appropriated for the Japan Key Technology Center, is included in the budgets of the Ministry of International Trade and Industry and the Ministry of Posts and Telecommunications, in duplication. (Duplications are eliminated in totaling).

(UNIT : MILLION YEN)

Major Policy Items	Budget for FY 1991	Budget for FY 1992	Increase or decrease(△)
1 Enhancing highly creative basis research and consolidating basis for science and technology promotion	23,971	26,695	2,725
(1) Promotion of basic research systems (ERATO and other basic research systems)	8,920	9,620	699
(2) Intensification of special researcher programs for young researchers	1,207	1,581	374
(3) Consolidating science and technology development	14,392	16,012	1,620
2 Promotion of science and technology aiming at more affluent life	11,348	13,505	2,157
(1) Promotion of human genome analysis	911	1,079	168
(2) Solution of problems closely related to living	10,941	12,987	2,046
3 Playing active in international society through science and technology	80,178	89,775	9,596
•Green Planet Project	10,306	18,855	8,549
•Human Frontier Science Program (HFSP)	2,194	2,284	90
•International Thermonuclear Experimental Reactor (ITER) Project	2,387	5,313	2,926
•Space Station Project	17,958	28,229	10,271
4 Comprehensive Promotion of Science and Technology Administration	11,187	11,721	534
•Increase Special Coordination Funds for Promoting Science and Technology	10,500	11,000	500
5 Promotion of research and development activities in the advanced and important fields of science and technology	489,371	516,707	27,336
(1) Nuclear development and utilization (including safety measures)	306,435	315,230	8,796
(2) Space development	131,769	144,622	12,853
(3) Ocean development	10,666	11,400	734
(4) Earth science and technology	35,662	31,648	△4,014
(5) Material science and technology	13,548	14,099	551
(6) Life sciences	18,976	21,350	2,375

Note : Because of overlapping some of budgets, cumulative amounts and total over may not be identical.

STA Budget for Fiscal 1992

(Unit : 100 million yen)

Item \ Fiscal Year	Budget for FY 1991(A)	Budget for FY 1992(B)	Increase or decrease (△)B-A
1 General account	3,895	4,119	224
2 Special account for industrial investment	38	38	0
3 Special account for power sources development	1,292	1,361	69
1. Account for the smooth siting of power plants and other nuclear energy facilities	281	311	30
2. Account for diversification of power sources	1,011	1,050	39
Total	5,226	5,518	292

Note : Because of rounding under 100 million yen, cumulative amounts and total amounts may not be identical.

Main Activities

Enhancing Highly Creative Basic Research and Consolidating Basis for Science and Technology Promotion

Exploratory Research for Advanced Technology (ERATO)

The Science and Technology Agency (STA) set up ERATO in 1981 as a system to undertake creative and basic research by selected researchers from industry, universities, government institutions and overseas for the purpose of producing original science and technology of Japan's own. Those researchers are organized into given groups for certain period under leadership of well-qualified project directors and encouraged to show their creativity fully.

At present 17 projects are in progress.

[System outline]

1. Implementing body: The Research Development Corporation of Japan (JRDC)

2. Administration

• [illegible] organization [illegible] widely from industry, universities, governmental organizations and overseas, and organized into groups for projects under leadership of well-qualified researchers (project directors).

• A research is managed in flexible manner so that its direction can be changed in accordance with progress of the project under judgement by project directors.

• A research is pursued in rented facilities in principle.

3. Project directors

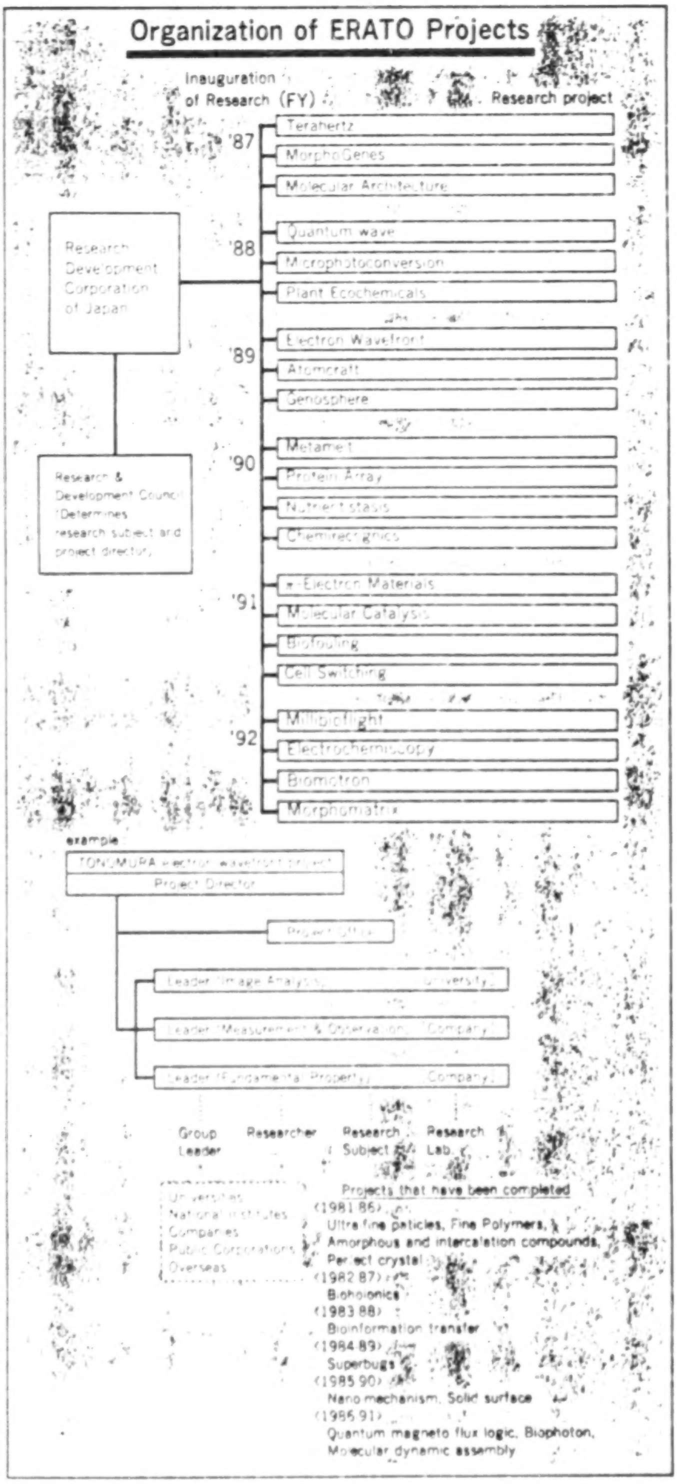
Project directors must possess the ability to organize and manage research, which needs to appropriately [illegible] researchers who work under his direct [illegible], and have deep insight and knowledge of the research subject.

4. Scale of research

Fund for a project is 1.5 to 2 billion yen during the project term, five years. A total number of researchers qualified for ERATO is 15.

5. Share of research results

[illegible] patent [illegible] resulted from project [illegible] shared by JRDC and individual inventors, which [illegible] give eminent researchers [illegible] for this system.



System for Incubating Novel Ideas

Recent advancement and sophistication of science and technology have made cross-disciplinary researches more significant than ever before. In the situation, STA started System for Incubating Novel Ideas in 1992 in order to promote creative or basic researches. Meetings consisted of talented researchers from various disciplines, various organizations including industry, universities, government and overseas are held for a certain period, and the members are expected to be engaged in discussion without being bound of their own disciplines in order to create and incubate innovative ideas that grow into creative and basic researches.

Precursory Research for Embryonic Science and Technology (PRESTO) System

When Japan constructed affluent society toward the 21st century and carries out international contribution to science and technology fields properly for our economic position in the world, it is essential to originate science and technology which leads the world, particularly to promote fundamental studies done at individual research level.

To this end STA started this System in 1991, which is managed mainly by the Research Development Corporation of Japan (JRDC). This system opens application of researchers who live in Japan, selects some who have original idea and talent among them, and they can study for certain period without any obligation.

[System outline]

1. Implementing body : JRDC

2. Administration

- JRDC selects specific research fields from such a point of view that they have the possibilities of greater breakthroughs in the 21st century. It opens applications by researchers who are specialized with those fields.
- Research director who gives advice is appointed for each research field, which makes smooth progress of researches.
- Selected researchers will belong to JRDC for certain period as long as the project is carried out (including part-time employment), and be engaged in researches with their unique ideas.

3. Scale of research

A research fund is 60 million yen for three years on the average (including personnel cost of researchers, rental fee of research facility)

Frontier Research Program

The Frontier Research Program was launched in October, 1986 by the Institute of Physical and Chemical Research (RIKEN) to carry out long-term fundamental research based on new ideas. Projects include researchers from an extensive range of scientific fields who work under an internationally open and flexible system beyond the framework of traditional research systems. Since 1990 this System has become open to the regional community in order to promote fundamental studies shared by researchers in the region who have eminent research ability in important research areas.

The main subjects of the research are as follows:

a. Bio-Homeostasis Research

This Program elucidates the mechanisms that regulate the physiological functions and maintain the homeostasis in animals and plants.

b. Frontier Materials Research

This program clarifies various phenomena exhibited in ultrafine structures of proteins, polymers, metals, etc.

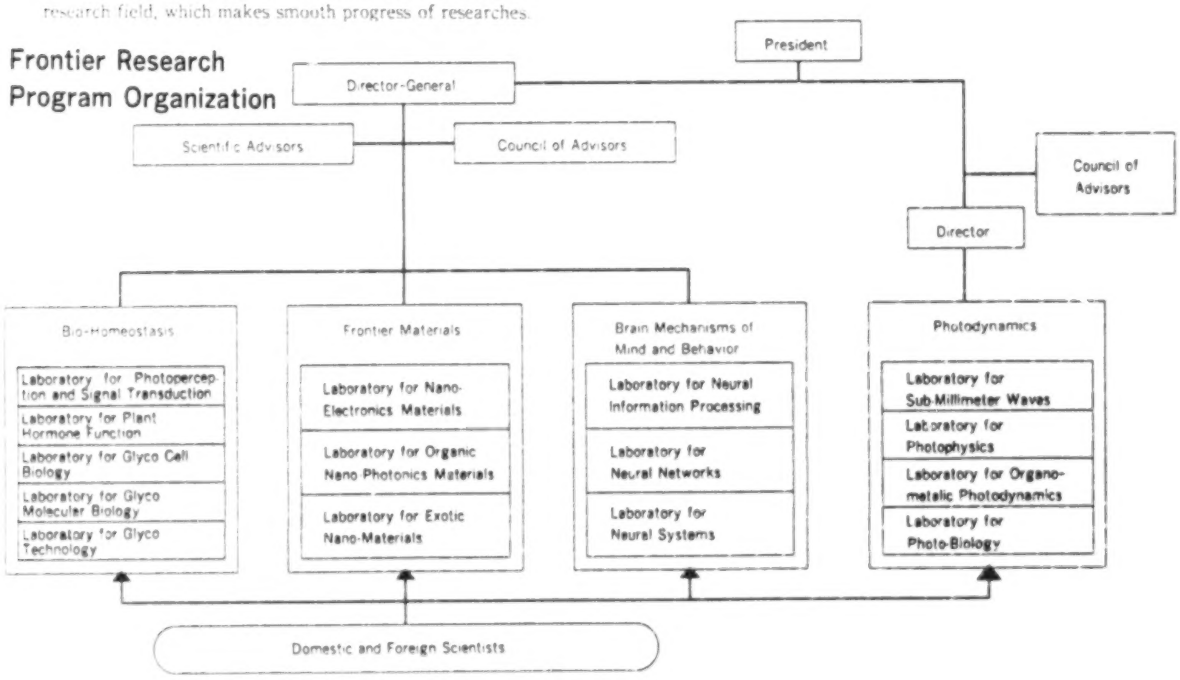
c. Research on Brain Mechanisms of Mind and Behavior

This Program elucidates the functional and structural principles of the brain through anatomical, physiological, and theoretical approaches.

d. Photodynamics Research

This Program clarifies photodynamic interactions in of light and matter through high quality photons.

Frontier Research Program Organization



Fostering Creativity

It is essential that Japan develops highly creative science and technology in order to make our society and national life richer and to contribute to the international community. In general, however, the research system in Japan is very focussed, and in characterized by lifetime employment where promotion is based on seniority. The system has been criticized as not providing researchers an adequate environment to demonstrat their individuality and make full use of their ability. In order to overcome these conditions, the "Special Science and Technology Researchers System" and the "Special Researcher Basic Science Program" were established.

Special Science and Technology Researcher System

This system was established in 1990. Using the Special Coordination Funds for Promoting Science and Technology, the system will place young, creative researchers into national institutes in order to significantly advance basic research at the institutes.

Researchers who are selected under this special system first submit applications to the STA. They then are screened by the Committee on Policy Matters of the Council for Science and Technology and are accepted by national institutes to which they have applied.

Special Researchers' Basic Science Program

This is a national program established in FY 1989 to provide Fellowships mostly for highly originative, young, Japanese researchers who are able to carry out their creative research on their own initiative in a free research atmosphere. The program will contribute toward the development of basic science in Japan.

In this program, STA is responsible for the selection of Special Researchers in Basic Science and for evaluating the Program. The researchers selected for this Program will engage in research at the Institute of Physical and Chenical Research (RIKEN).

Promotion of the Next-Generation Synchrotron Radiation Facility

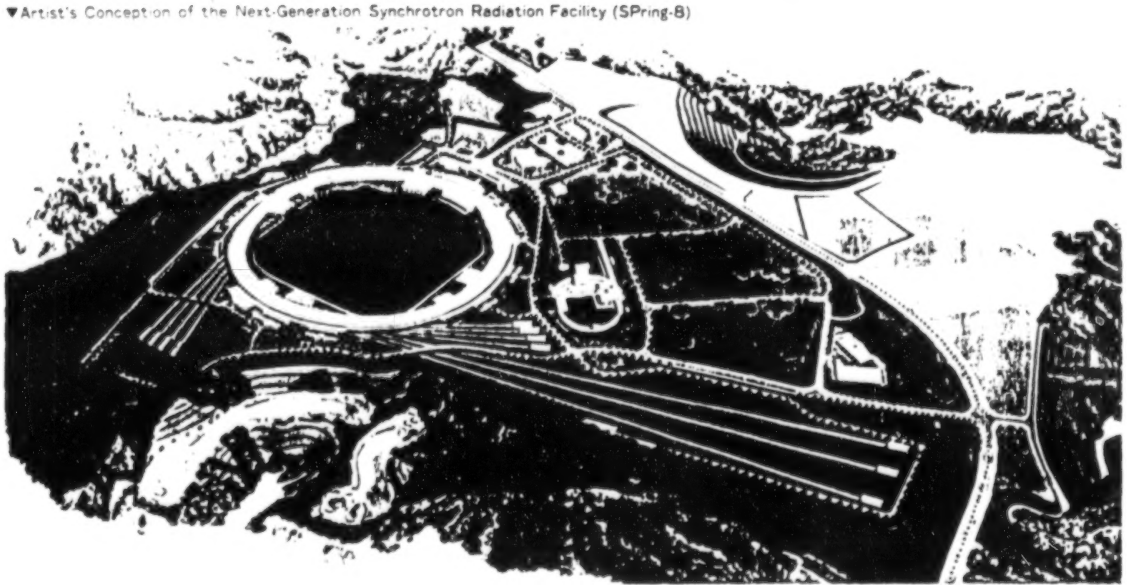
SPring-8 Project

Synchrotron radiation has remarkable features, including high blilliance, sharp directivity, and a broad spectral range from the infra-red and visible spectra to the X-ray region.

STA is promoting the next-generation synchrotron radiation facility, which is called "SPring-8". It will have a stored electron energy of 8 GeV and will advance basic research in a wide range of fields such as material science and technology, life science, information and electronics science and technology, and also promote international collaboration. SPring-8 is to be sited in the Harima Science Garden City of Hyogo Prefecture. It is being constructed by the Japan Atomic Energy Research Institute (JAERI) and the Institute of Physical and Chemical Research (RIKEN), and is scheduled to be completed in 1998.

Artist's Conception of the Laboratory ▶

▼Artist's Conception of the Next-Generation Synchrotron Radiation Facility (SPring-8)



Promotion of Research Exchanges

In recent years, R&D has become more advanced and complex, and the boundaries of research fields have extended and overlapped. Under these circumstances, to promote creative science and technology in the future. It is vital to not simply stick to existing systems and institutions but to make efforts to promote research exchanges among different organizations.

The Law for Facilitating Governmental Research Exchange was put into effect in November 1986 to promote research exchanges. Moreover, in March 1987 the cabinet approved the "Fundamental policy for the efforts by national research institutes to promote research exchanges among industry, universities and government, and those with foreign countries." In these and other ways steps have been taken to create a favorable social environment in response to the expanding requirement for research exchanges. Furthermore, a tax law was revised in April 1992 in order to eliminate various restrictions which hamper promotion of research exchanges. Furthermore, in fiscal 1986 the "Special Institution for Joint Research by Government and Private Enterprises" was established to further activate STA's research activities to make full use of the research potential of the private sectors.

In addition, STA is the managing body for the following consolidating research facilities at Tsukuba Science City. As one of these efforts the Tsukuba Center for Institutes was established in 1978.

Its purpose is to provide a place where researchers from other personnel meet together and exchange information and opinions, and to provide information on science and technology from all over the world to researchers in the city. Further, the Center will promote research activities to make the best of the opportunities offered by the concentration of research institutes and universities in Tsukuba. The functions of the Center include serving as the secretariat of the Tsukuba Council for Promotion of Research Cooperation, the Tsukuba Network Administering Project, [illegible] researchers, and supporting of seminars and symposia in the City.

▲ Tsukuba Center for Institutes (Tsukuba Science City)

Promotion of Regional Science and Technology

Promotion of regional science and technology has become increasingly important as a driving force to activate regional economy, which gives great help not only to construct many fair and decentralized nation land but also to advance quality of life for the regional people and serves to improve our nations science and technology standard efficiently. In the recent years, we see increase in such regions that they aim to develop themselves by promoting R&D functions which they build STA's promising the following policies in order to support R&D activities of regional communities and then to promote science and technology there.

(1) Promotion of regional research exchanges (Regional Research Exchanging Networks)

Research exchanging networks are being established to serve as focal points for enhancing regional R&D.

(2) Joint research utilizing science and technology potential in region

Outstanding researchers not only from the region but also from all over the nation are engaged in researches which [illegible] standard in the nation.

(3) Regional fruition research programs

In those regions which have a high research potential in universities, research centers, fundamental researches is being carried out by investigators from the region itself and by researchers from the Institute of Physical and Chemical Research.

(4) Regional joint R&D activities

R&D [illegible] is being pursued through cooperation between regions and JAMSTEC.

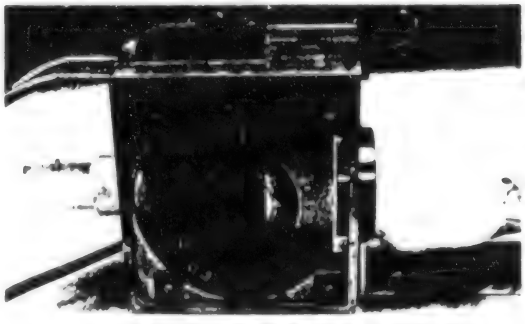
(5) Regional S&T Policy Conferences

Through the exchanges of views on S&T policy among Prime Ministers [illegible] Science and Technology and advisory bodies, these conferences is strengthening the [illegible] regional and national S&T policies.

(6) [illegible] conference

Solutions to [illegible] S&T related problems are being discussed in order to establish the foundation for promoting science and technology in each region.

▼ Analytical Methods for Free Radicals in Life Sciences through the Joint Research Utilizing Scientific and Technological Potential in Region



Development of New Technology and Technology Transfer

a. Cooperative Development of Industrial Technology

b. Coordination for Licensing

c. High Technology Consortium

Promotion of Scientific and Technical Information Distribution

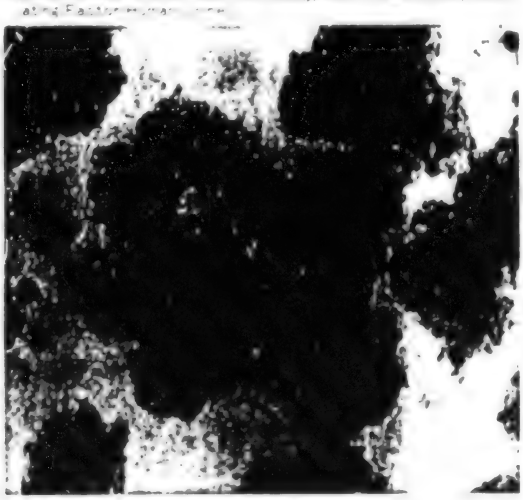
Scientific and Technical Information has been increasing drastically as a result of a vast amount of recent R&D activities. It is said that the amount of such information published per year is 2 million within Japan and 5 million in all over the world.

In the fast road construction of advanced information society, it progressed rapidly and the development of technologies for information processing is remarkable. As a center of such information, the expectation to Japan from overseas countries is increasing year by year. To cope with these status, STA implements mainly through the Japan Information Center of Science and Technology (JICST) as follows:

1. Constructing bibliographic databases on science and technology which enables researchers to find relevant information quickly from the vast volume of information, and providing them through its own network.
2. Developing machine aided translation system and knowledge base using highly progressed technologies for information processing.
3. Operating international information network and preparing various technologies.

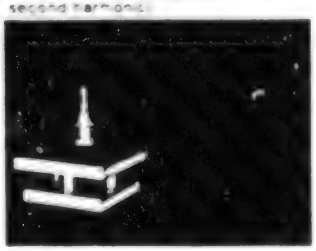
STA also focuses its efforts on making an easy access to Japanese sources of which demand is increasing from the overseas countries. To this end, STA is preparing English databases for such information.

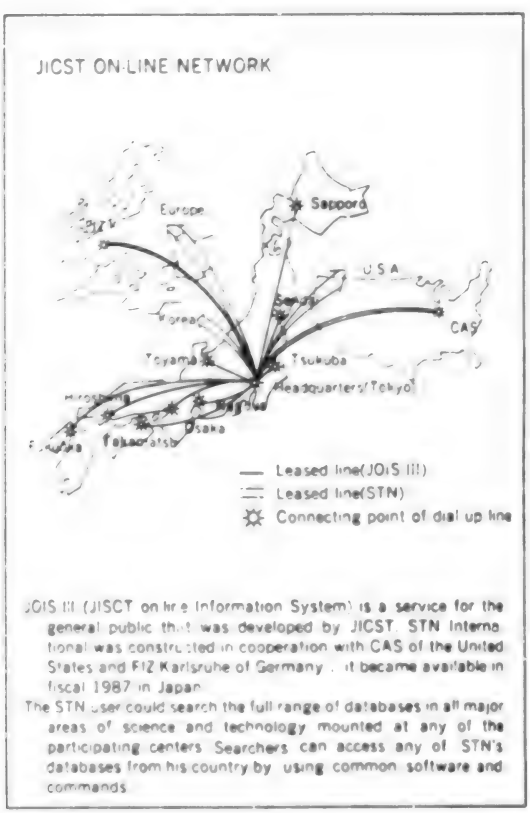
▼Development of production technology for GSF Hu Colony Stimulating Factor Human ...



▲New organic non-linear optical crystal which can be a device for transforming wave length.

▼Transforming infrared laser light into visible light emission at the second harmonic.





JOIS III (JICST on-line Information System) is a service for the general public that was developed by JICST. STN International was constructed in cooperation with CAS of the United States and FIZ Karlsruhe of Germany. It became available in fiscal 1987 in Japan.

The STN user could search the full range of databases in all major areas of science and technology mounted at any of the participating centers. Searchers can access any of STN's databases from his country by using common software and commands.

Main Activities

Promotion of Science and Technology Aiming at More Affluent Life

Promotion of Human Genome Analysis

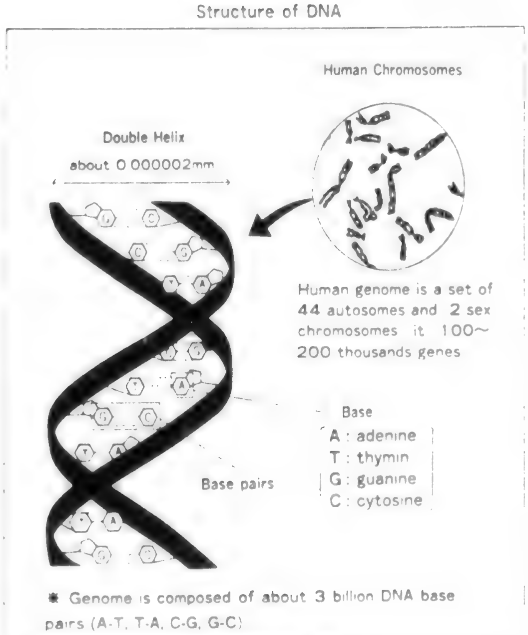
Analysis of human genome is to read all the base sequence of about 3 billion DNA on 24 types of chromosomes which exist in human cells.

Each of human genes has particular sequences of tens to ten thousands bases of DNAs which correspond to particular functions [illegible] and it is estimated that genes [illegible] 24 types of chromosomes are from one hundred thousands to two hundred thousands in number.

Human genome analysis brings great influence upon researches on life sciences including diagnosis, remedy of gene related diseases such as cancer, Alzheimer's disease, elucidation of life phenomena such as aging mechanism, and is ultimately expected to contribute to welfare of mankind.

STA is promoting to consolidate the basis for human genome analysis through the development and preparation of the genome [illegible] and DNA base sequence analyzing system executed by the Institute of Physical and Chemical Research (RIKEN), and also involved in international joint sponsorship and project management of GDB (Genome Database) which is a center of human genome mapping data. Moreover STA has other R&D undertaken human genome analysis by Special Coordination Funds for Promoting Science and Technology, the National Institute of Radiation Science and JRDC's Exploratory Research for Advanced Technology.

Structure of DNA



Solution of Problems Closely Related to Living

a) Promotion of joint research utilizing science and technology potential in regions

STA has undertaken joint researches utilizing science and technology potential in a region since 1990 in cooperation with the metropolis and districts and the related ministries in order to promote regional science and technology as well as improve Japan's science and technology standard. Under directorship of well qualified research leaders in regions researchers outside and inside the region are organized and carry out fundamental or advanced studies in which regional science and technology potential and characteristics are utilized at research institutes there. At present 6 prefectures are involved in this program.

In addition, from 1992, this program is extended to cover research areas to improve the standard of living.

b) Promotion of cancer related research

Deaths by cancer accounts for about one fourth of total deaths in Japan. Countermeasures against cancer are nationwide urgent issue to be tackled. According to "the Comprehensive 10 year Strategy for Cancer Control" STA is putting the followings forward: study for elucidating mechanism of canceration; metastasis (Special Coordination Funds for Promoting Science and Technology and RIKEN); hardly curable of heavy ion medical accelerator for treatment of intractable cancer (The National Institute of Radiological Sciences, NIRS)

c) Research on prediction of earthquake

The STA excavated three boreholes approximately 3,000m depth, which penetrated weak strata and then reached igneous rock under the metropolitan area. The agency then installed observatories in order to establish earthquake prediction facilities in the area. At the present time earthquake record and deformaton of the crust are observed at these boreholes.

There is no precedent in the world for such an observation facility. It is an observation technique that is peculier to Japan's metropolitan area, which enables the STA to obtain a clear estimated of the shape of subducting plates, and identify very shallow earthquake hypocenters in the region to within 30 km.

d) Research related to volcanoes

The STA is consolidating its observation network that studies volcanic activity. This network enables the agency to observe constantly and study crustal movement earthquakes, geomagnetics, temperature, volcanic gases, and other quantities at active volcanos such as Iwo-jima, Izu Oshima, and in regions peripheral to those volcanos. The STA is also conducting observations and studies by thermotics method using airborne MSS specifically oriented to thermal observation of volcano. This apparatus was independently developed by the STA and unique to the agency.

The STA is also promoting studies on forecasting of large scale landslide in volcanic regions which cause large scale damage in a wide area.

Main Activities

Playing Active Roles in International Society through Science and Technology

As a member of the International Community

International Science and Technology Interchange Framework

[General Science and Technology Fields]

Bilateral Cooperation

[Atomic Energy Fields]

[Space Fields]

[Others]

Multilateral Cooperation

[Others]

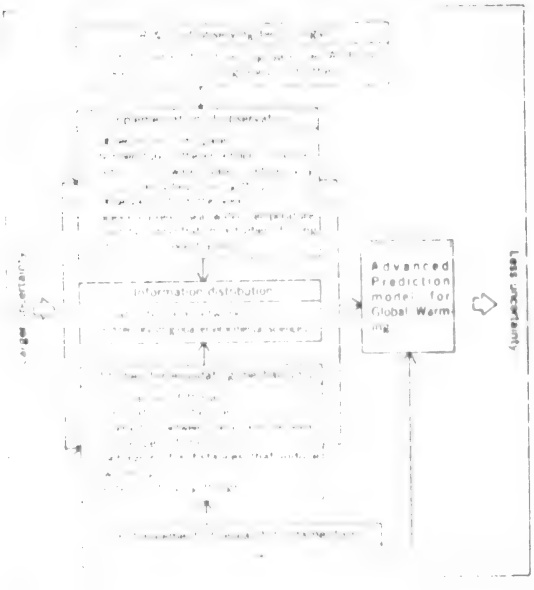
Comprehensive Promotion Toward Clarifying and Predicting Global Warming Phenomena

a) Long-term observation and monitoring of global warming

b) Enlarged research for clarifying and predicting global warming

c) Information gathering related to global warming and promotion of its distribution

Outline of Green Planet Project



The Human Frontier Science Program

The Human Frontier Science Program(HFSP) is an international cooperative program, begun at Japan's initiative, which promotes basic research on elucidating the sophisticated and complex mechanisms of living organisms.

The organization for implementing the HFSP was established in Strasbourg, France in October, 1989.

Activities of the program are as follows.

- Research Grants : Grants for basic research carried out by international joint research teams consisting of researchers early in their career.
- Fellowships : Fellowships for young researchers who wish to do research in foreign countries.
- Workshops : Subsidies for international workshops where researchers exchange up-to-date information on focal points of research.

International Thermonuclear Experimental Reactor (ITER) Project

ITER Project is an international collaborative program jointly undertaken by Japan, the U.S., EC and Russian Federation to demonstrate the scientific and technological feasibility of fusion energy for peaceful purposes. Fusion energy is expected to be the ultimate energy source for mankind. ITER Project stems from the joint statement announced at the U.S.-USSR summit meeting in 1985. Based on the result of Conceptual Design Activities implemented from 1988 to 1990, ITER Engineering Design Activities has started in 1992. The joint central teams for joint design work will be set up in Japan (Naka), the U.S. (San Diego) and EC (Garching).

[Outline of Engineering Design Activities]

- Term : 6 years starting in 1992
- Design Activities : equivalent to 1,200 man-year (about 250 million dollars)
- Engineering R&D : about 750 million dollars

Space Station Program

The Space Station Program is an international project conducted jointly by the U.S., member nations of the European Space Agency (ESA), Canada and Japan under an Intergovernmental Agreement. Space is a new frontier for mankind and this program is the first step to manned space activities of long duration. Japan is participating in this program by developing the Japanese Experimental Module (JEM). At present, JEM is under development, with scheduled launch in FY 1998. The major objectives of the space station are directed toward full-fledged space development and utilization to promote science and technology. The preparation for full use of space station is now underway and Japanese astronauts, who will be stationed on board the space station, are being trained.

International Research Exchange Promotion Programs

New activities to promote international research exchanges were inaugurated by the Research Development Corporation of Japan (JRDC) on October 1, 1989, to meet other countries' expectations for international roles of Japan in science and technology and to promote science and technology in Japan in cooperation with international societies.

These activities include the following.

a) International joint research program ····· The international joint research program has been carried out under close cooperation with foreign research institutes to draw out new ideas and concepts in fields of fundamental science and technology research which will develop into new technology. JRDC is continuing joint research program on new materials with [illegible] and London Univ., the U.K., which started in F.Y.1989, and the joint research program on microbial evolution with Univ. of Michigan, the U.S., started in F.Y.1990. JRDC has another joint research program on supermolecules with Louis Pasteur Univ., France, which started in F.Y.1991.

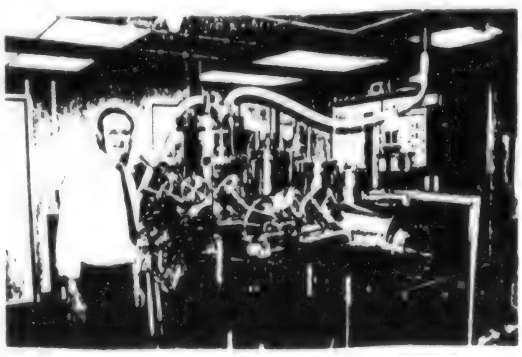
b) Promotion of International Research Exchange

*Support program ··· The JRDC is managing accommodations for foreign researchers constructed in Tsukuba Science City. In addition, conveniences, such as Japanese language training, daily living counselling in English, and daily living information brochures in English, are being provided for foreign researchers and their families.

*Research information program ··· Information on Japan's research activities is being provided to foreign research institutes and to foreign researchers who want to learn about the trends of Japan's science and technology and about research exchanges with Japanese counterparts.

c) Fellowship program ··· In fiscal 1988, STA created the STA Fellowship Program whereby overseas researchers are accepted in Japan's national institutes. The JRDC began operating the program from October 1989.

	No.of awardees (No.of partner nations)	No.of host research institutes in Japan
FY1988	100 persons (23 countries)	37 research institutes
FY1989	130 persons (31 countries)	44 research institutes
FY1990	160 persons (38 countries)	59 research institutes
FY1991	180 persons (46 countries)	60 research institutes
FY1992 (scheduled)	185 persons	···



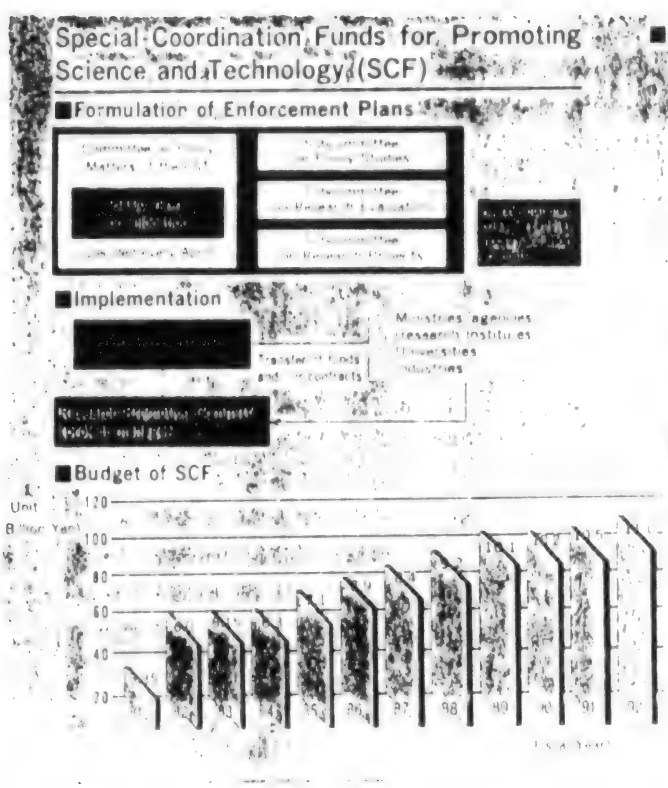
▶ U.K.-Japan joint research project "Atom Arrangement Design and Control for New Materials"

Main Activities

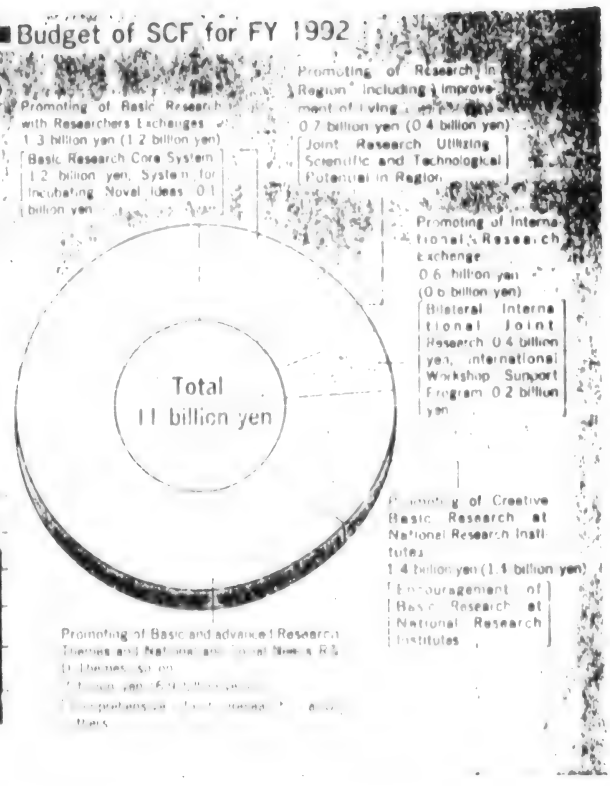
Promotion of Science and Technology Administration

Planning and Formulation of Science and Technology Policy

Major Points the Basic Policy for Science and Technology



Overall Coordination Functions in Science and Technology Administration



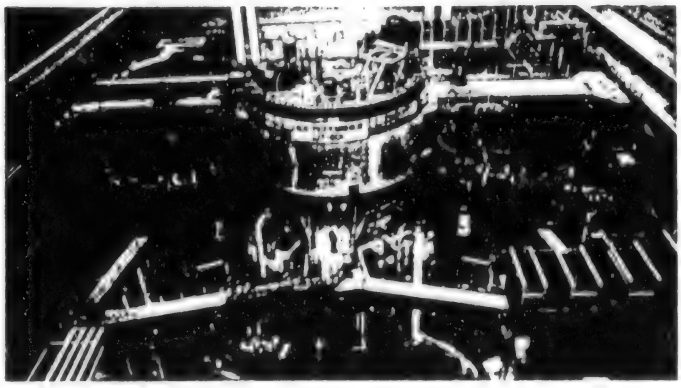
Promoting Science and Technology Policy Research

Main Activities

Promoting Research and Development in Advanced Fields of Science and Technology

Nuclear Energy ····· Toward an enriched 21st century

▲FBR



▲

Promotion of Nuclear Power Generation

Establishment of the Nuclear Fuel Cycle

The nuclear fuel cycle consists of uranium mining, refining, conversion, enrichment, fabrication, reconversion, spent fuel reprocessing, and radioactive waste treatment and disposal facilities.

a Securing of uranium resources

Japan must rely upon foreign countries for uranium supply. The Power Reactor and Nuclear Fuel Development Corporation (PNC) has been promoting [illegible]

b Uranium enrichment

PNC [illegible] Demonstration Plant at the Ningyo-Toge Works and is constructing a pilot enrichment plant employing high performance centrifuges made of new materials. Using the fruits of PNC's R&D activities, a private company began operating a commercial uranium enrichment plant since March, 1992.

In addition, next generation technologies including the laser isotope separation technology are being developed.

c Reprocessing

The PNC is promoting the R&D activities on reprocessing technology aswell as the stable operation of the Tokai Reprocessing Plant. Moreover,the PNC is providing technical support for the commercial reprocessing plant in Rokkasho-Mura. (Now,it is under licensing)

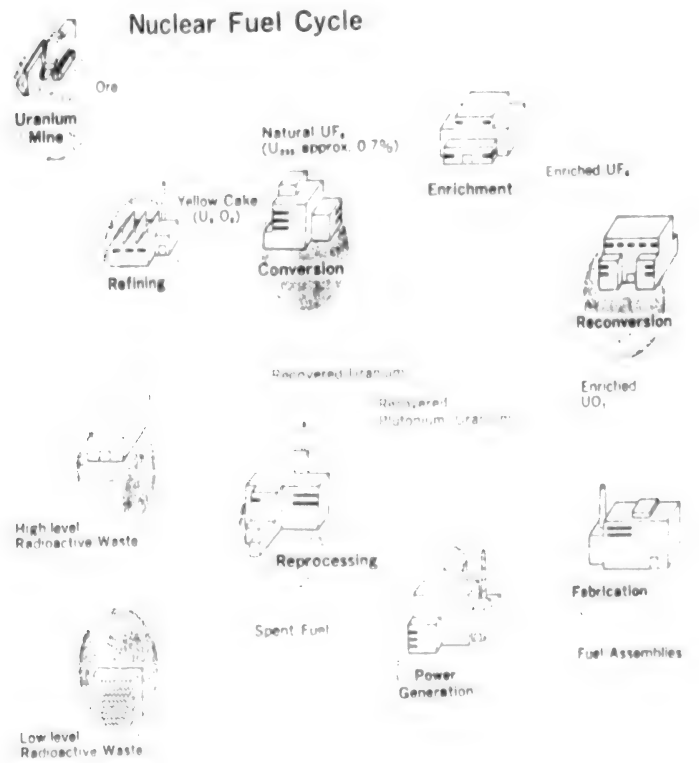
d Radioactive waste management

As for Low level radioactive waste, a private company is constructing a land burial facility. The government has established safety standerds and guidelines related to land disposal.

Efforts are also being made to develop nuclear reactor decomissioning technology.

As for high level radioactive waste, PNC plays a role of core organ in R&D for geological disposal. PNC has a plan to establish a "Storage Engineering Center" to study geological disposal technology in deep underground formations and to store vitrified high level radioactive wastes.

STA is promoting a project of advanced waste treatment technology. This project involves two technical [illegible] called partitioning and transmutation of TRU (trans uranium) elements. It is being conducted in cooperation with several research institutions. International cooperation program in this field called "OMEGA Project" is underway.



Development of Nuclear Reactors of New Types

PNC has been playing a key role in developing nuclear reactors of new types, the Fast Breeder Reactor(FBR) and the Advanced Thermal Reactor (ATR), which make more efficient use of uranium resources than do light water reactors.

The experimental FBR reactor "JOYO" (thermal power 100 MW) is in operation and the prototype reactor "MONJU"(electrical power 280 MW)is now in preparation for attaining criticality scheduled within F.Y. 1992.

The prototype ATR reactor "FUGEN" (electrical power 165 MW) is in operation.

PNC is also contributing to the project of demonstration reactors aiming at the early commercialization of FBR and ATR.

Promotion of Leading Projects

a. Nuclear Fusion

Research and development activities in nuclear fusion, expected to be a permanent energy source in the future, have been promoted vigorously.

In September 198[illegible], the break-even plasma test equipment of JAERI's "JT-60" achieved its target parameter range for plasma conditions set by the Atomic Energy Commission.

The JT-60 is now under operation to develop higher plasma performance.

Japan also takes active part in the International Thermonuclear Experimental Reactor (ITER) project which is promoted through international cooperation among Japan, the United States, the European Community, and Russian Federation.

b. Utilization of radiation

Radiation is expected to find a broad range of applications, and a variety of R&D activities are being promoted. These include:

(1) The National Institute of Radiological Sciences (NIRS) is undertaking research on cancer treatment [illegible] Heavy Ion Beam.

(2) The RIKEN [illegible] studies of nuclear [illegible] science [illegible] the RIKEN RING CYCLOTRON.

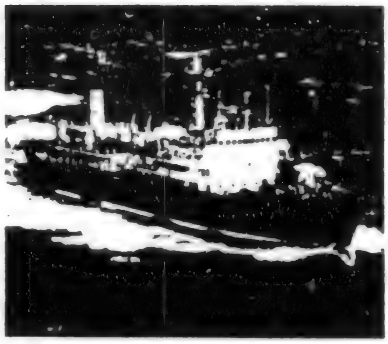
(3) JAERI [illegible] facility [illegible] Research Project for Advanced [illegible] Technology.

c. Nuclear-powered vessel

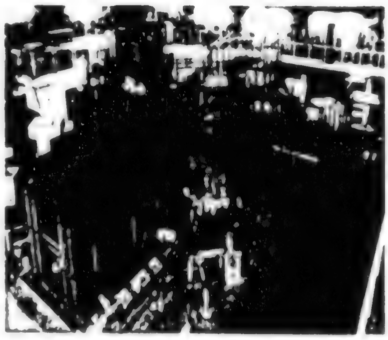
JAERI has successfully completed the experiment of the nuclear-powered vessel "Mutsu" and [illegible] R&D of new [illegible] data and [illegible] experiment.

d. High-temperature engineering experimentation and research

The high temperature gas reactor has [illegible] high thermal efficiency [illegible] inherent safety and high [illegible]. JAERI is now constructing a high temperature engineering test reactor as a further foundation for a high temperature gas-cooled reactor and to promote advanced basic research related to high temperature engineering.



▲Nuclear Powered Vessel "Mutsu"



▲RIKEN Ring Cyclotron

▲Atomic Energy Day

Facilitating the Siting of Nuclear Energy Installations such as Nuclear Power Plants

To gain the public understanding and cooperation in safety and necessity of nuclear power, Japan is performing variety type of activitites for public acceptance nuclear power, such as grass roots type (dispatching experts to study meeting held by citizens, etc.) and participation type (renting radiation counter, etc.).

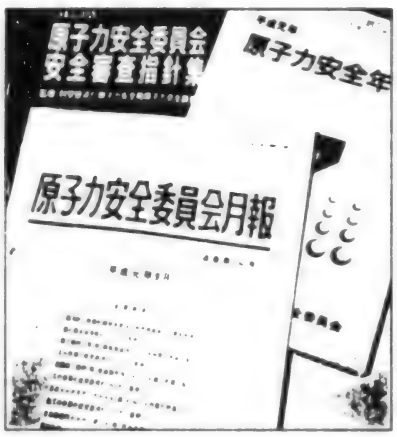
Promotion of International Cooperation

As a leader in the peaceful use of nuclear energy, Japan is required to contribute internationally to the development and utilization of nuclear energy. Japan is actively pursuing international cooperation, not only with other industrialized countries in such large-scale projects as International Thermonuclear Experimental Reactor(ITER) but also with developing countries in Asia and with such international bodies as International Atomic Energy Agency(IAEA), and Nuclear Energy Agency in the Organization for Economic Cooperation and Development(OECD/NEA).

To ensure the peaceful use of nuclear energy, and to implement safeguards (a nuclear materials management system to confirm that nuclear materials for peaceful use are not diverted to military use) based on international agreements such as Non Proliferation Treaty, Japan established and continue to strengthen the domestic safeguards system.

Efforts are also being made to further strengthen the physical protection of nuclear materials from nuclear facilities.

Nuclear Safety……For assuring safety of nuclear energy

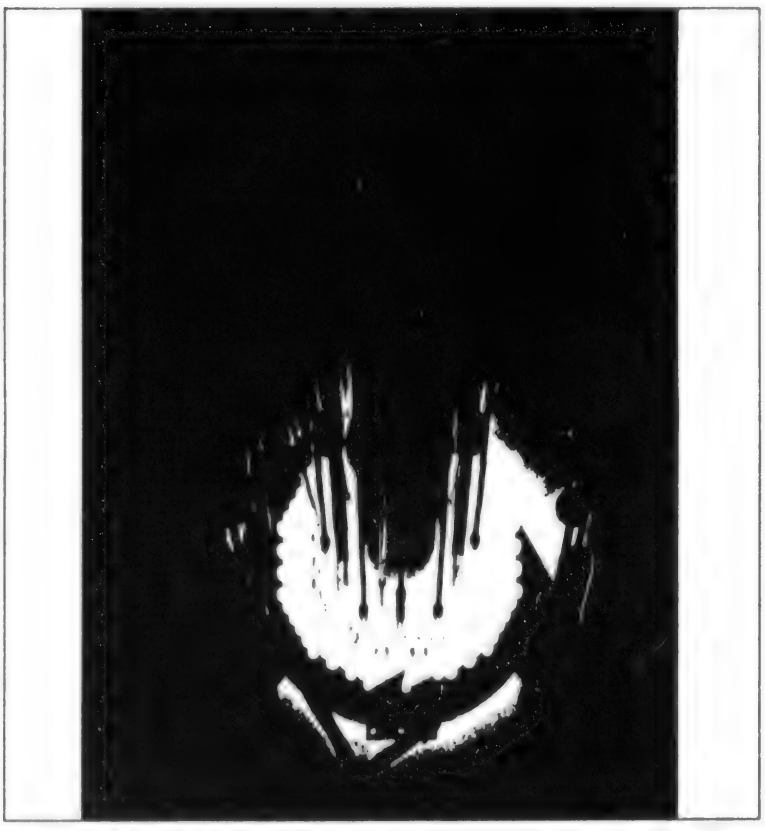


Safety Regulations for Nuclear Energy Facilities, etc

While promoting the development and utilization of nuclear energy, the single most important issue is the assurance of safety. Consequently, all the nuclear power facilities in Japan are subjected to strict and uniform legal regulations and surveillance at every stage from the planning to operational control. Safety regulations are enforced at each stage, from the acquisition of permission for the facility through its operation and final decommissioning. In addition, further investigation and research are being conducted to improve and make more efficient current safety regulations.

These regulations are based on the Law concerning regulation of nuclear source materials, nuclear fuel materials and nuclear reactors." The law and other regulations are revised whenever necessary.

Safety regulations of radioisotopes, synchrotrons and other radiation generators are based on the "Law concerning the prevention from radiation hazards due to radioisotopes, etc."



▲ Checking by photomicrography of the core of a pulse-operated reactor

(Example) Case of Nuclear Reactor

(Outline of Safety Regulation Procedures)

Application received for approval of facility

↓

Examination conducted by government agency

↓

Double check made by Atomic Energy Commission and Nuclear Safety Commission

↓

Permission granted for facility

↓

Approval given of design and construction methods

↓

Pre-use inspection, approval of safety provision and others

↓

Periodic, on-the-spot, and other inspections

Safety Research

The Japan Atomic Energy Research Institute (JAERI) and the Power Reactor and Nuclear Fuel Development Corporation (PNC), are leading Japan's vigorous efforts, fast breeder reactors and other new types of power reactors, Safety resaerch dealing with reprocessing plants, and other nuclear fuel cycle facilities also is being conducted, radioactive waste disposal facilities.

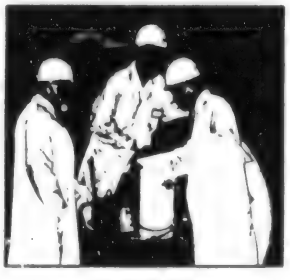
National Institute of Radiological Sciences (NIRS) also is researching the effects of low-level radiation on the human body and other impacts of radioactivity such as plutonium, on the environment.

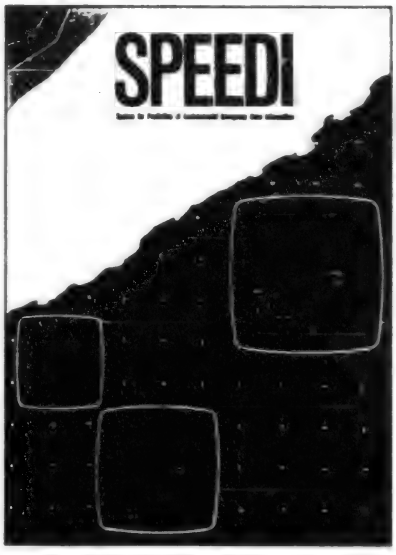
Off-Site Emergency Response Measures and Environmental Radioactive Surveys

Various disaster prevention measures have been established to secure the health and safety of local residents in the event of an emergency at a nuclear power plant. These include establishing emergency telecommunication networks, emergency monitoring systems, emergency medical treatment systems, and systems to dispatch exparts to local areas.

In addition, investigations are being made of radioactive fallout from nuclear testing, radioactive potential of nuclear warships, and of radioactivity in the vicinity of nuclear power facilities. Data obtained from these investigations are compiled to monitor and determine the overall level of radiation in the environment.

STA
(Nuclear Safety Bureau)





▲ System for Prediction of Environmental Emergency Dose Information (SPEEDI)

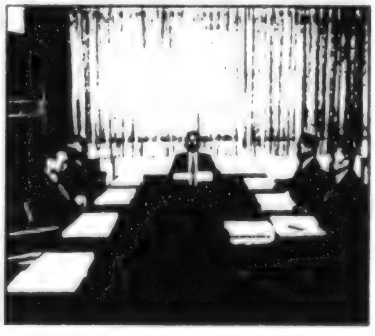
Nuclear Safety Commission

The Nuclear Safety Commission advises the Prime Minister, the Commission is responsible for policy matters and regulations concerning safety of nuclear facilities, safety regulations for nuclear fuel materials and reactors, and of protection from hazards caused by utilizing atomic energy.

For instance, the Commission performs safety examinations from a strictly neutral standpoint, and formulates various safety standards. The Commission also investigates major nuclear accidents and failures inside and outside the country and contrasts foreign safety measures with those of Japan.

The STA acts as the secretariate of the Nuclear Safety Commission.

Nuclear Safety Commission



Space Development ……A step toward space

Space Development Policy

Space is mankind's newest frontier. Space development and utilization results in new advanced technical industries in many fields.

Japan's space development program is being comprehensively and systematically implemented under the Space Activities Commission in accordance with the Commission's "Fundamental Policy of Japan's Space Development" and its annual "Space Development Plan".

The "Fundamental Policy of Japan's Space Development" was published in March 1978. It was first revised in February 1984, and again in June 1989, responding to the change of circumstances related to space development in Japan, such as the progress of technology in Japan and large-scale international cooperative activities. The fundamental principles of this policy are①response to advancing and diversifying needs, ② consistency with Japan's role in international society, ③ encouragement of activities of private sector.

Organizational Scheme for Space Development

Japan's space development has been undertaken by the National Space Development Agency of Japan (NASDA), the Institute of Space and Astronautical Sciences (ISAS) of the Ministry of Education and other governmental research institutes.

NASDA continues to develop a variety of satellites for earth observation, meteorological observation, communication, broadcasting and engineering test, as well as rockets for launching those satellites. As of March 31, 1992, 29 satellites have been launched, using rockets such as N-I, N-II and H-I. ISAS has been devoted to the development of scientific satellites and rockets for launching them. As of March 31, 1992, 20 scientific satellites have been launched.

Furthermore, pioneering and fundamental research is being pursued by the governmental research institutes including the National Aerospace Laboratory (NAL).

The State of Space Development

During fiscal 1991 the H-I launch vehicle took aloft the Broadcasting Satellite(BS)-3b "YURI-3b" and the 14th Scientific Satellite "YOUKOU" in August 1991, and the Japanese Earth Resources Satellite(JERS)-1"FUYOU-1" in February 1992.

These launches show that Japan's space program is making steady progress.

In order to realize well-off and pleasant life in Japan, and with the aim of meeting responsibility of international contribution to space development activities in the world, R&D on launch vehicles and various satellites has been conducted and will be carried forword.

Satellite and Launch Vehicle Development Projects

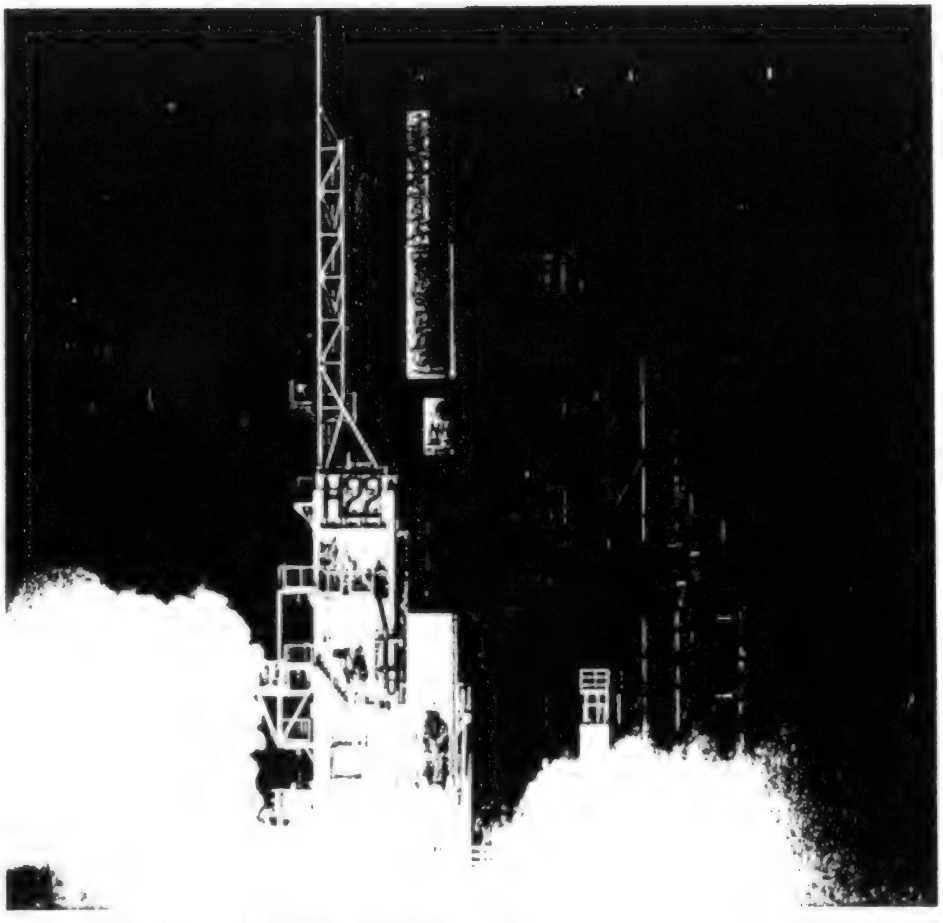
The National Space Development Agency of Japan (NASDA) is promoting the following projects.

ⓐ Satellites

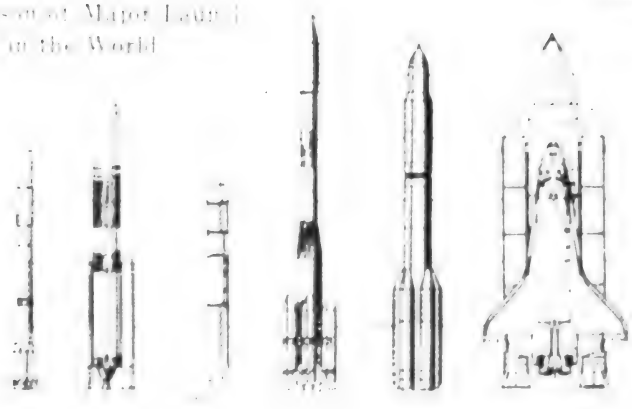
NASDA has launched and developed a variety of satellites. The launch schedules of those satellites are: Engineering Test Satellite VI (ETS-VI), Geostationary Meteorological Satellite-5 (GMS-5) and Space Free Flyer Unit (SFU) in F.Y.1994, and Advanced Earth Observing Satellite (ADEOS) in F.Y. 1995, and Communications and Broadcasting Engineering Test Satellite (COMETS) in F.Y.1996, all to be launched by H－II rockets, and also R&D of Tropical Rainfall Measuring Mission (TRMM) has been promoted.

In F.Y.1992 NASDA has initiated research and development of Engineering Test Satellite-VII (ETS-VII).

ETS-VII aims at establishment of ren-



Comparison of Major Launch Vehicles in the World



dezvous/docking technique and remote operating technique which is essential mission to conduct space activities for the early part of the 21st century.

b. Launch Vehicles

b) To meet the demands for launching large scale satellites in the nineties, H-II launch vehicle capable of launching 2 ton class geostationary satellites is under development toward the first launch to be scheduled in FY1994.

Also in F.Y.1992 NASDA has started research and development of small-type launch vehicle capable of launching 1 ton class satellites on low orbit. It is to meet the demands for launching small scale satellites at low cost.

NASDA is also researching H-II Orbiting Plane (HOPE) which will assist future full-swing space station.

c. The First Material Processing Test Program (FUWATTO '92)

A Japanese payload specialist is scheduled to fly on board the Space Shuttle in September 1992, to conduct material processing and life sciences experiments in space. The training programs for the prime and back up payload specialists are being implemented.

d. International Microgravity Laboratory Program (IML)

IML is an international microgravity experiment executed by NASA and supported by worldwide cooperation. Japan has joined this Program and provides her own developed onboard equipments for IML-1 and IML-2. IML-1 has been implemented since January 1992, and IML-2 is scheduled for F.Y. 1994.

e. Space Station Program

The Space Station Program is an international project to build a permanent manned laboratory in orbit. [illegible] of 1988.

NASDA has been developing the Japanese Experiment Module (JEM), a part of the space station [illegible] which the U.S., Europe, Canada and Japan participate under a multilateral agreement. In September 1988, Japan signed the Intergovernmental Agreement, which [illegible] after the detailed design phase of the Program. Japan's part of the project has already entered the full scale development phase. The first space station element will be launched in F.Y. 1995 (JEM is scheduled to be launched in F.Y. 1998). Permanently Manned Capability will be achieved around F.Y. 1999.

International Cooperation

a. Cooperation with the United States

Since 1979, the U.S.-Japan Standing Senior Liaison Group (SSLG) has been holding regular sessions to discuss the progress of cooperative projects between the U.S. and Japan, and to study possible new cooperative projects.

b. Cooperation with Europe

Since 1973, the European Space Agency (ESA) and Japan have regularly held meetings to exchange information as well as engineers.

c. International Space Year (ISY)

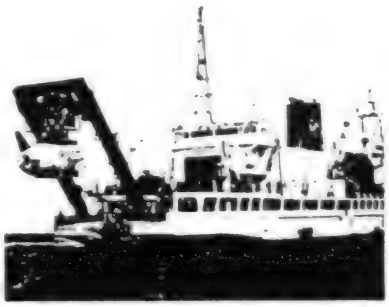
The year of 1992 is set up as International Space Year.

The Space Agencies Forum on ISY has discussed how international cooperation is undertaken in earth observation activities and how well space development and its use are enlightened and spread over. Japan has participated in ISY activities along with the U.S. and European countries.

d. Others

Japan has been participating in various international cooperation activities such as membership in the U.N. Committee on Peaceful Uses of Outer Space, directly receiving data from nature observation satellites at [illegible] ESA, Australia, Canada and Thailand and others.

Ocean Development……The future in the ocean



▲Deep-sea research submersible "Shinkai 6500" and its support vessel "Yokosuka"

▲Specimen of sea cucumber observed at Japan Trench (depth of 6,468m)

Coordination of the ocean development throughout the Government

Promotion of fundamental and leading ocean science and technology projects

a. Seeking the mastery of deep seas
—Deep sea exploration and research and deep sea bio-technology

greatest submerging capability in the world.

JAMSTEC is also conducting R&D on deep sea drilling vessel system which serves as powerful mean to promote studies of earth science and technology. It is expected as follows: changes in the global environment; history of Earth's evolution; the mechanism of earthquake generation; and so on.

Research being conducted using Shinkai 6500 will include deep sea biotechnological studies such as clarifying the ecology, extracting certain function of living things which grow in special environment of deep sea, and studies on circulation of materials such as carbon at the deep sea.

b. Understanding the processes of the ocean —development of ocean observation technology and implementation of ocean studies

To understanding processes of the ocean, that is closely related to changes in the global environment, STA is engaged in the development of comprehensive ocean observation technology including ocean acoustic tomography technology to enable observation of the ocean widely and three-dimensionally.

Furthermore, STA participates in global-scale international joint programs ocean researches, for instance the World Ocean Circulation Experiment, the Japan-U.S. Joint Research Program on the Kuroshio and a comprehensive ocean observation program in North Pacific and the Arctic Ocean.

c. Using the ocean effectively —Development of coastal utilization technology, and promotion of ocean science and technology for regional development

Regional technological development includes wave energy utilization, creation of calm sea area, sea weed cultivating farms by removing unuseful weed, improving the environment inside bay in order to make effective use of marine resources such as energy, living things, space, and so on.

These are carried out in close contact with local interest through demonstration tests at local sea areas, or collaboration with local government.

Earth Science and Technology

·····A Green earth for our children

Earth science and technology is concerned with various global-scale phenomena which can threaten the very foundation of human existence. These phenomena include global warming, reduction of tropical rain forests, abnormal weather, and massive earthquakes. By investigating the atmospheric, hydraulic, geological,and biological conditions which bring about these phenomena and the mutual interactions among them, the mechanisms behind these phenomena can be clarified, impacts can be forecasted, and steps can be taken to solve various problems. It is extremely important to engage in such activities now and in the future.

Since an accumulation of scientific knowledge is essential for solving these problems, the STA is promoting research on these global-scale phenomena and on earth observation technology.

Research on Clarifying Global-Scale Phenomena

With the cooperation of relevant government ministries and agencies, the follwing kinds of research are being conducted to clarify global-scale phenomena.

[a] Research with Special Funds for Investigation and Research of Earth Science and Technology

Fluctuations in tropical forests and resulting effects

Behavior of substance causing global warming

Japanese Cloud and Climate Study (JACCS)

[b] Research with the Special Coordination Funds for Promoting Science and Technology

Japanese Pacific Climate Study (JAPACS)

International joint research for clarifying the mechanisms of desertification

Japanese Experimental Study in the Arctic Area

etc.

▲Ocean surface temperature distribution image taken from the Marine Observation Satellite-1 (MOS-1)

▲ Observation of change the global environment by the Advanced Earth Observing Satellite (ADEOS)

R&D for Earth Observation Technology

Satellite remort sensing using light or electric waves emitted by or reflected from targets has become an extremely important for earth science and technology research, which requires long-term and continuous observation of the entire earth. Accordingly, STA and the National Space Development Agency of Japan (NASDA) are conducting the following measures.

[a] Development of the large-scale (about 3.5 tons) earth observation satellite ADEOS (Advanced Earth Observing Satellite, to be launched in F.Y. 1995) to make an international contribution toward solving global environmental problems.

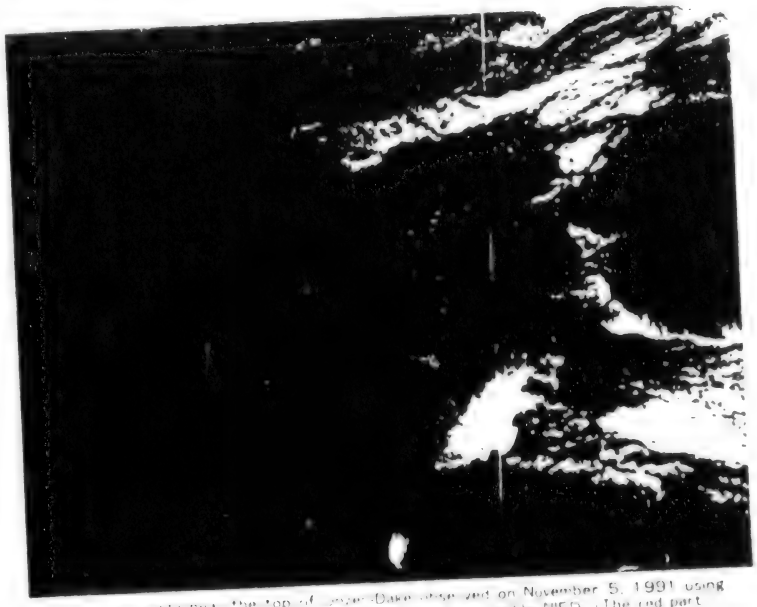
[b] Research and development of the Tropical Rainfall Measuring Mission satellite (TRMM), and under international cooperation participation in the International Polar orbit Platform Project.

[c] Operation of the Marine Observation Satellites (MOS-1 : launched in February 1987; MOS-1b: launched in February 1990), the Earth Resources Satellite of Japan 1 (JERS-1: launched in February 1992) to establish active observation techniques, and collection, processing and distribution of their data.

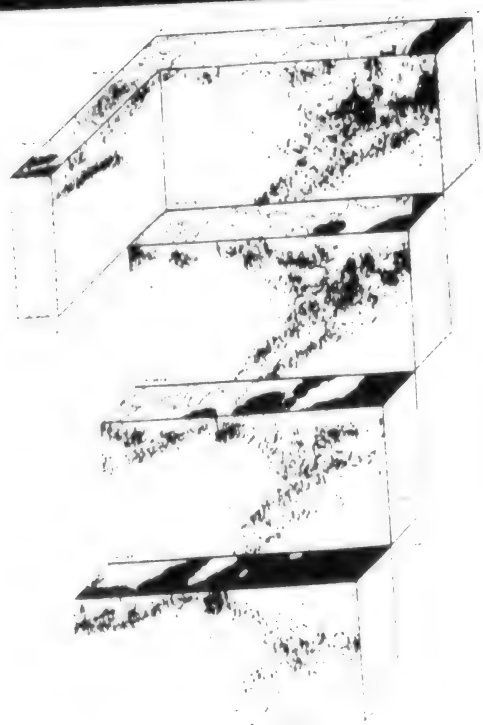
[d] Research on remote sensing technology for its application to tropical areas as well as comprehending global environmental problems, etc.

To clarify various phenomena of the earth, it is extremely important to deepen our understanding of the oceans since they accout for about 70 percent of the Earth's surface. Consequently, at the Japan Marine Science and Technology Center, R&D for ocean observation technology is being conducted. This R&D includes the development of ocean lasers, the deepsea submersible (Shinkai 6500) and ocean acoustic tomography to study and observe the mechanisms of change in the oceans.

Disaster Prevention ····· Readiness is all



A [illegible] of Mt. Unzen-Dake erupted on November 5, 1991 using [illegible] by NIED. (The red part [illegible] of ground surface.)



Material Science and Technology

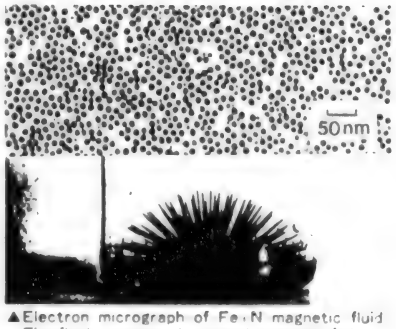
……From micro to macro

Materials science and technology provides the foundation for development of other fields of science and technology. Materials science and technology is anticipated to play continuous role as driving force for technological innovation.

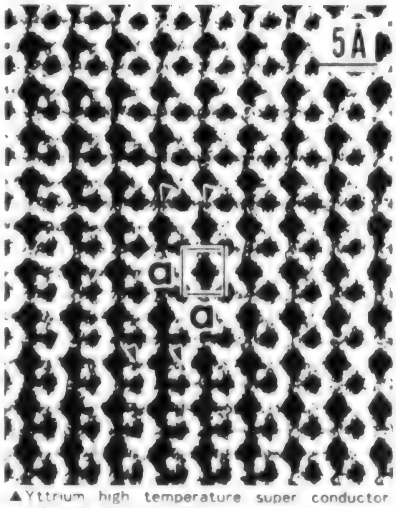
In advanced science and technology fields new materials are highly demanded such as superconducting materials, high temperature materials, high strength materials, and electronic materials that have never been expected to emerge before. From the time forward it will be increasingly important to create more innovative functional materials other than the existing ones using new concepts.

To this end STA is promoting comprehensive R&D of materials including fundamental and applied studies that are mainly performed by the National Research Institute for Metals (NRIM) and the National Institute for Research in Inorganic Materials (NIRIM), and funded by the Special Coordination Funds for Promoting Science and Technology, Exploratory Research for Advanced Technology (ERATO) and the Frontier Research Program (RIKEN).

▲Testing for the Meissner effect with a new type superconductor



▲Electron micrograph of Fe_4N magnetic fluid. The fluid is seen to be raised magnetic field.



▲Yttrium high temperature super conductor taken by electro-microscope.
(Black dots pointed by arrows indicate oxygen atoms, the first successful observation done in the world)

Promotion of Research and Development

[a] Promotion of the Multi-Core Research Project on Superconducting Materials

Since FY 1988 under this Project fundamental/basic studies on superconducting materials have been carried out in a flexible collaboration with researchers from industry, academia, governmental organizations and overseas.

[b] Promotion of R&D on Intelligent Materials

Responding to the report submitted by the Council for Aeronautics, Electronics and Other Advanced Technologies, STA is promoting R&D of intelligent materials that detect, justify and conclude environmental conditions, and give some direction or behave according to the decision the materials make.

[c] Studies at the National Research Institute for Metals (NRIM)

NRIM concentrates its effort on new materials mainly in the unexplored areas such as rare metals, intermetallic compounds, and reliability assessment of materials.

The studies are concerned with :

- New superconducting materials and intelligent materials
- Improvement of Mechanical Properties of Intermetallic Compounds by Crystal Growth Control
- Development of Quantum Micro Structeres in the Ultra Clean Vacuum

[d] Studies at the National Institute for Research in Inorganic Materials (NIRIM)

Studies on creation of ultra pure non metallic inorganic materials and the similar materials are undertaken by Group Research Scheme (each research group is assigned particular materials to be studied), that is different from usual research system taken by other national research institutes.

The studies are concerned with :

- New superconducting materials and intelligent materials
- Research and Development of Soft X-ray Monochromator for Synchrotron Radiation Application
- Reciprocal-type Radical Source for Preparing Fine-ceramics Thin Films

[e] Others

STA is promoting materials science and technology through Frontier Research Program by RIKEN, Exploratory Research for Advanced Technology (ERATO) by JRDC, the Special Coordination Funds for Promoting Science and Technology and others.

Life Sciences……Searching for secrets of life

Life sciences emcompasses everything from elucidating life phenomena to application of the benefits of research results.

Promotion of life sciences

Following the direction made by the Council for Science and Technology (CST) provides overall policy coordination for the related government ministries and agencies. The fundamental and innovative life science studies or research support service are executed by the appropriate research organizations under the control of STA.

[a] Promotion of anti-cancer studies

The death of anti cancer about one fourth of the total death in Japan, so that countermeasures against cancer is nation-wide urgent issue to be dealt with. According to "the Comprehensive 10-year Strategy for Cancer Control" STA is putting the followings forward: study for elucidating mechanism of canceration, metastasis (Special Coordination Funds for Promoting Science and Technology or the Institute of Physical and Chemical Research, RIKEN); installment of cancer treatment apparatus employing heavy ion beams (The Natinal Institute of Radiological Sciences, NIRS).

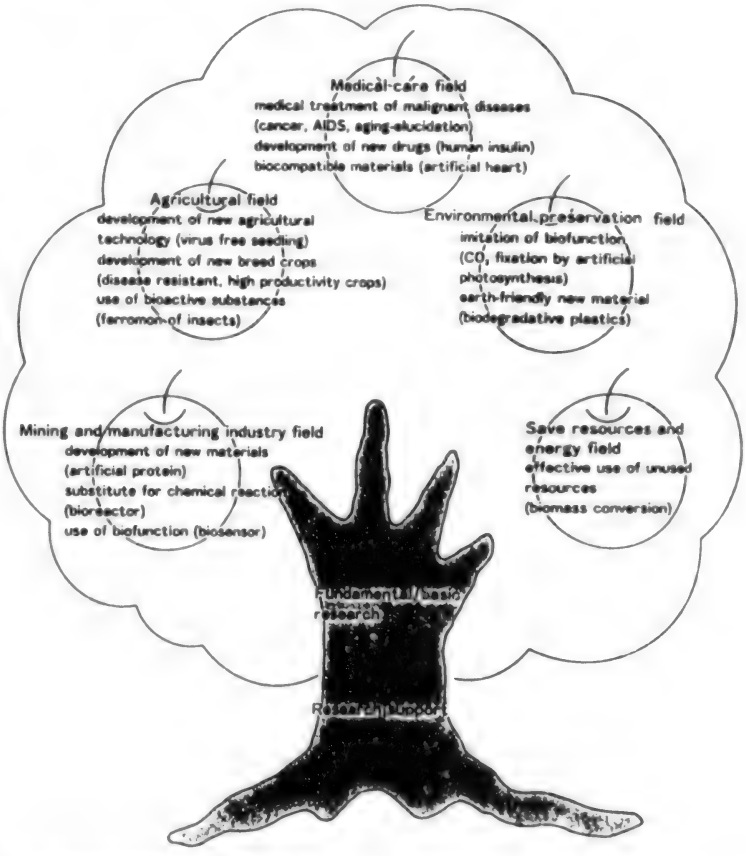
[b] Promotion of human genome analysis

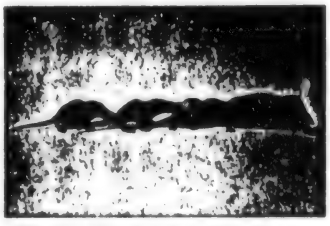
Human genome analysis is to read base sequence of human DNA. This study is expected to be applied to diagnosis and treatment of malignant diseases and clarification of evolution mechanism of living things. STA is promoting development of human genome analysis automated system, and preparation of research materials (RIKEN).

[c] Promotion of recombinant DNA studies

Recombinant DNA research are important studies conducted in wide areas from fundamental one to applied one.

For safety assurance in those recombinant DNA experiments "Guidelines on Recombinant DNA Experiments" were enacted by the Prime Minister in August, 1979.





▲Behavior of caravan by suncus murinus, a new model animal developed by RIKEN

[d] Promotion of fundamental and innovative studies

Fundamental and innovative life sciences studies are undertaken by the appropriate research institutes under the control of STA, and those studies make great contribution to human welfares, including clarification of aging, AIDS related studies and glycotechnology research. Also STA endeavors to promote those studies utilizing various research schemes or institution related to life sciences.

Examples of scheme or institution related to life sciences studies

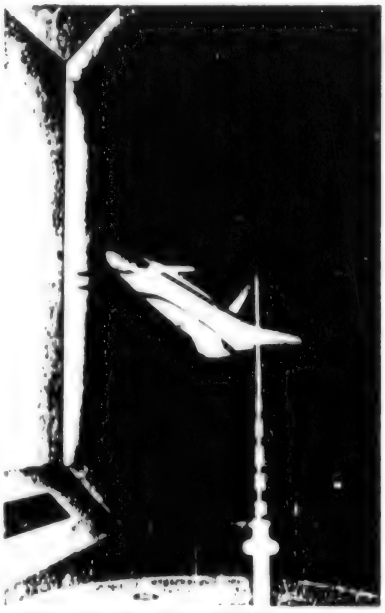
- ○Special Coordination Funds for Promoting Science and Technology
- ○Biodynamics (RIKEN)
- ○Frontier Research Program (RIKEN)
- ○Gene Bank Project (RIKEN)
- ○Exploratory Research for Advanced Technology (Research Development Corporation of Japan, JRDC)
- ○Cooperative Development of New Technology (JRDC)
- ○Application of heavy ion beams to cancer treastment (NIRS)
- ○Deep-sea Environment Exploration Program (Japan Marine Science and Technology Center, JAMSTEC)
- ○The Human Frontier Science Program
- ○Consolidation of document databases (The Japan Information Center of Science and Technology, JICST)

Aeronautical Technology ····· The coming 21st century

Research of Advanced Aeronautical Technology

The National Aerospace Laboratory (NAL) has consolidated various large scale test equipments and facilities including the transonic wind tunnels, composite structure testing facilities, and promoted advanced and fundamental studies using such facilities in order to promote R&D on aeronautical technology toward the 21st century. These facilities are often shared for research purpose by other related governmental organizations, aeronautical researchers, and so on.

Succeeding to the previous year, NAL is also promoting studies on innovative aerospace transportation technologies, and conducting special modification of transonic wind tunnel, supersonic wind tunnel



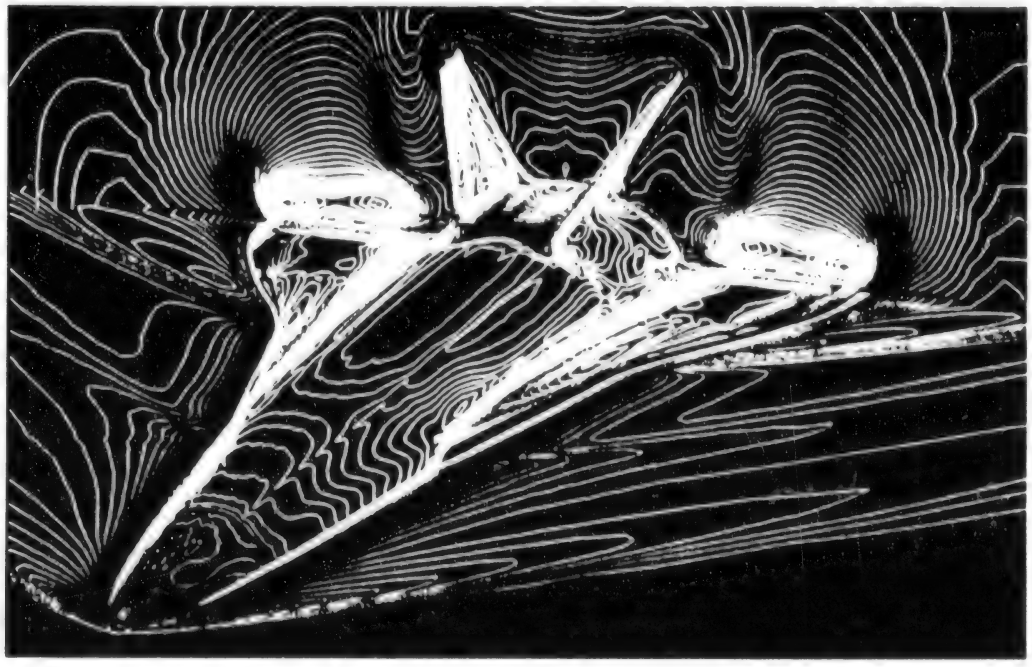
▲Wind tunnel test of an active control model

Promotion of research on innovative aerospace transportation technologies

NAL has conducted advanced element techniques as cores of H-II Orbiting Plane (HOPE) and Space plane which is technology covering aeronautics and space, innovative airplanes that enable efficient long distance transportation with a large amount of loading, ultra supersonic airplane, and so on.

In 1992 NAL is continuing the following studies and has started to study ultra supersonic navigation demonstrating technique and landing demonstration technique, aerodynamic technology, technology for advanced composits structure, flight control technology, propulsion technology, manned space activities, orbiter maneuvering engine, space plane system study.

▼Numerically-simulated airflow around a space plane model



Functions of The STA

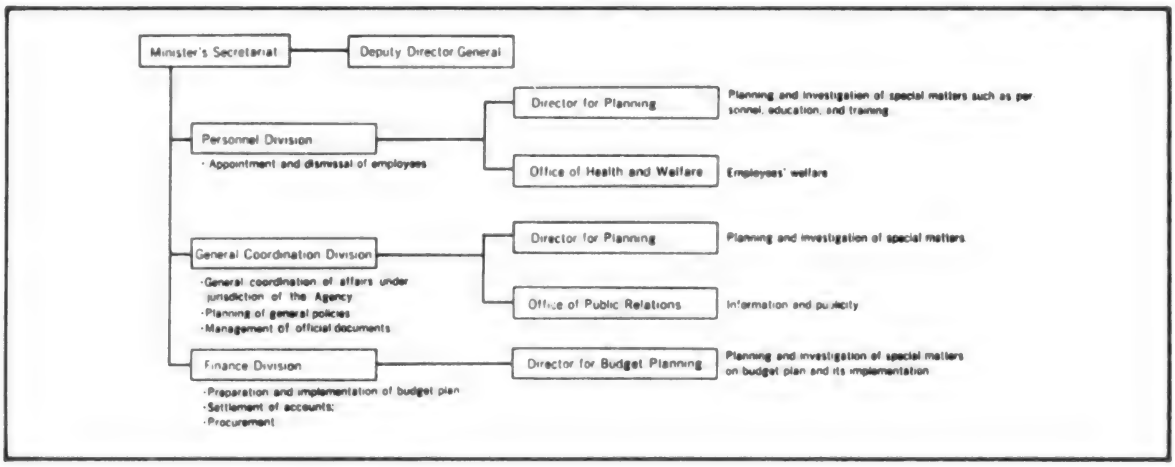
Minister's Secretariat

At STA research and development are carried out over a broad range of fields including nuclear energy, space and ocean development. Programs are expanded to promote science and technology in Japan in a diversity of ways.

The Minister's Secretariat gives special attention to how science and technology policy and administration should be established in Japan for the future. Hence the Minister's Secretariat fills the role of coordination so that the various policies of the Bureaus, each having its own orientation, can be throughly integrated.

The Secretariat oversees the Agency's administrative activities, including general coordination, budget and settlement, personnel affairs, so on.

It is also the duty of the Minister's Secretariat to disseminate clearly understandable information about the Agency's policy and administration so that the understanding and cooperation of the Japanese people can be obtained and policy administration can be carried out smoothly.



Science and Technology Policy Bureau

1. Plans, formulates and promotes science and technology policies

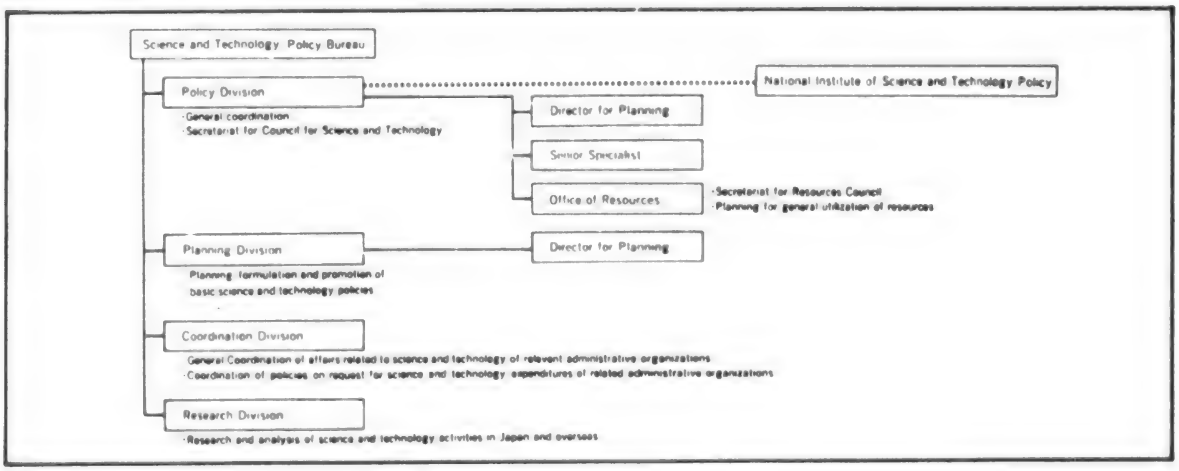
STPB is engaged in planning, formulating and promoting of fundamental and comprehensive science and technology policies to meet the demands of a new era. Further as the administrative arm of Prime Minister's Council for Science and Technology, the Bureau presides over issues requiring cooperation with other ministries and agencies.

2. Coordination of science and technology affairs

To promote science and technology efficiently and effectively the Bureau coordinates budget requests of each ministry's and agency's science and technology activities. Moreover, the Bureau oversees the management of the Special Coordination Funds for Promoting Science and Technology (SCF), which are used for important researches.

3. Publication of the White Paper on Science and Technology, International correspondence, so on.

The Bureau is responsible for publishing the White Paper on Science and Technology, based on the analysis of annual science and technology trends. The Bureau also develops policies governing the use of resources, promotes the Human Frontier Science Program (HFSP), and participates in the activities of the Committee for Scientific and Technological Policy in the Organization for Economic Cooperation and Development (OECD/CSTP).



Science and Technology Promotion Bureau

1. Promotes basic research

Steps are being taken to establish and promote various systems and institutions to enhance basic and creative researches.

2. Consolidates the basis to promote R&D

The Bureau is taking special measures to make the research environment in Japan attractive to Japanese and foreign researchers. Examples include promoting of research exchanges, improving of research conditions at Tsukuba Science City, developing and using of large scale synchrotron radiation facility, and promoting of information exchange.

3. Advances international science and technology exchanges

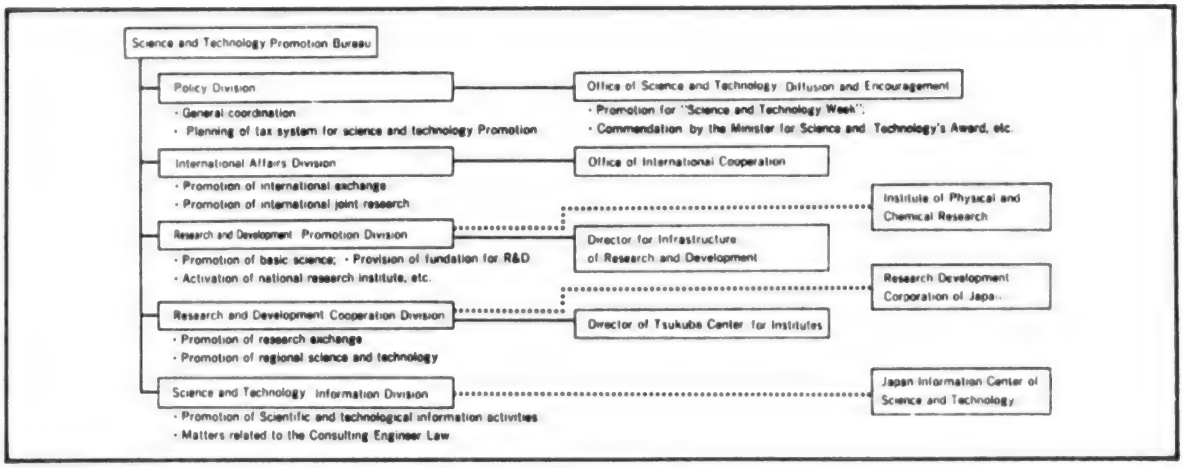
The Bureau is advancing various international cooperation and exchange activities under the framework of bilateral and multilateral cooperative agreements or cooperation with international organizations.

4. Promotes regional science and technology

The Bureau seeks to expand regional R&D and takes measures to promote R&D activities inside regions.

5. Disseminates and encourages science and technology

To deepen public understanding of science and technology, the Bureau is taking measures to disseminate information related to science and technology, and also granting awards and commendations for noteworthy inventions.

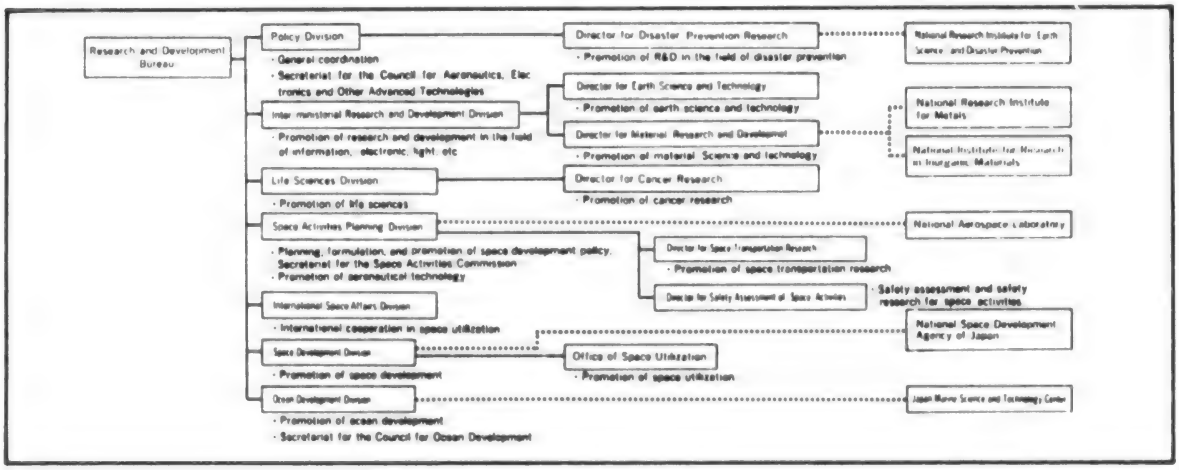


Research and Development Bureau

Space is the newest frontier for mankind. The Bureau has carried forward space development activities proper for status of Japan in the world, based on the deliberation in the Space Activitites Commission.

The Bureau also promotes a diversity of research comprehensively in cooperation with Japanese and foreign research institutes, in order to explore the oceans which occupy about 70 % of the Earth's surface and has enormous amount of resources, and clarify world-wide issues nowadays, global environment change such as global warming, ozone layer destruction, so on.

Furthermore the Bureau is engaged in disaster prevention researches such as earthquake and volcanic eruption prediction, science on materials such as superconducting materials, life sciences such as cancer research, advanced science and technology such as aeronautics.

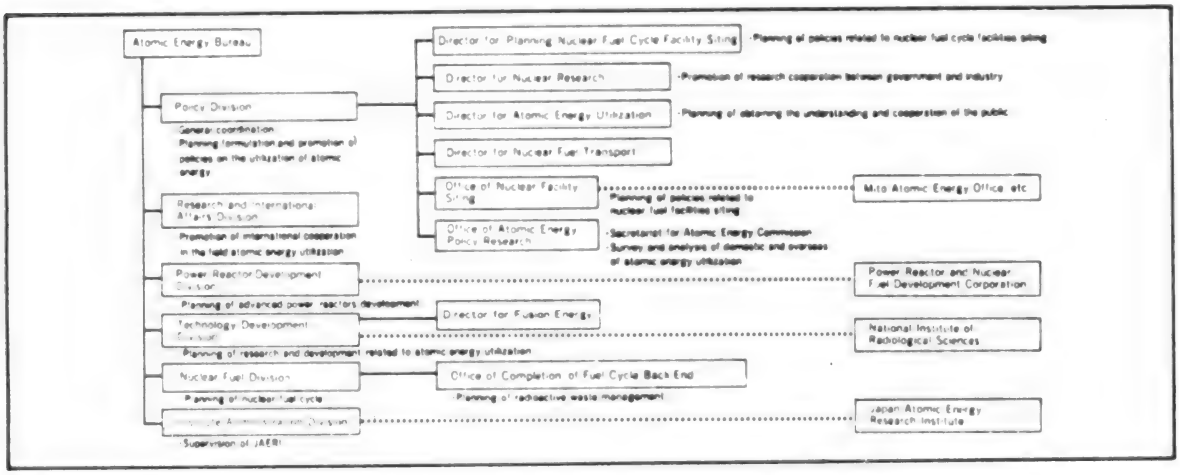


Atomic Energy Bureau

Japan still relies on imported energy for 80 % of its demand, and stable growth in energy demand is expected from now on. With such situation it is necessary to promote development and use of atomic energy which is outstanding in terms of stable supply, economy, environmental influences.

To this end the Bureau is taking measures to establish independent nuclear fuel recycling, construct prototype FBR "MONJU", develop new type of nuclear reactors, conduct R&D on nuclear fusion, develop cancer-curing device using radiation, produce and conduct other advanced projects.

Also the Bureau has made contribution to enhance world's Non-Proliferation Treaty system as one of the nations seek peaceful use of nuclear energy, involved in large-scale cooperative projects such as nuclear fusion with the U.S. and Europe and participated in technical cooperation with developing countries in radiation use fields, so on.

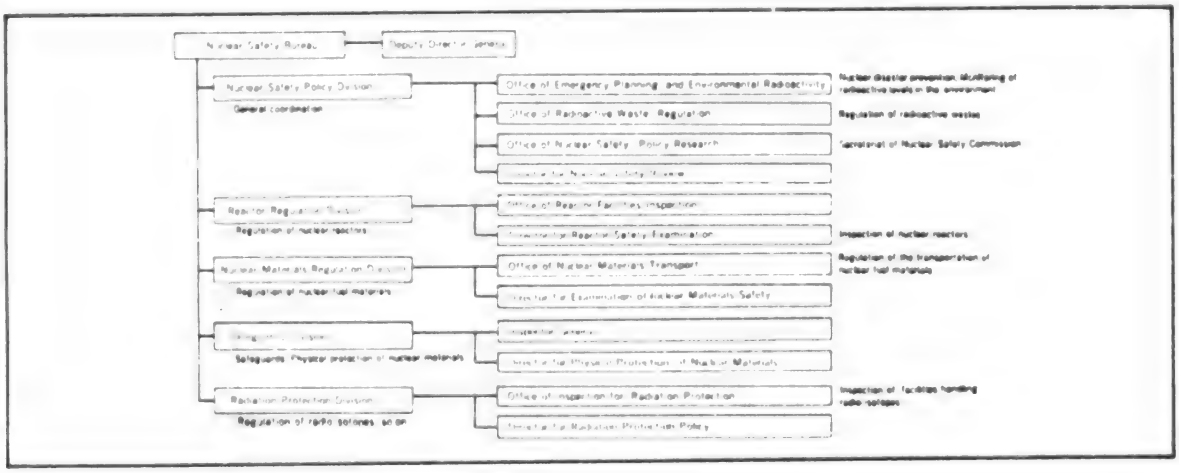


Nuclear Safety Bureau

To ensure safety is a major premise in promoting R&D and use of nuclear energy. The Bureau has imposed strict regulation and control on facilities for recycling nuclear fuel, installment of reactors and their operation, and also made every effort to improve safety based on lessons gained from accidents or failures occurred not only in Japan but also overseas.

The Bureau has taken the followings in order to promote safety of nuclear energy:

1. Safety regulations for atomic reactors, nuclear fuel facilities, so on
2. Off-site emergency response measures and environmental radio activity surveys
3. Secretariate of the Nuclear Safety Commission
4. Nuclear safeguards and physical protection of nuclear materials
5. Safety regulations of radio isotopes, so on



Prime Minister's Advisory Bodies

Council for Science and Technology	This council is the supreme advisory body with regard to science and technology policies. It submits reports and gives advice as required, concerning the following matters. The Prime Mnister shall pay due consideration to the views of the council. (1)Formulation of fundamental and comprehensive policies for science and technology; (2)Establishment of long-term and comprehensive goals of research and development; and (3)Formation of basic measures to accomplish the above goals etc.
Atomic Energy Commission	This commission plans, deliberates and decides on the following matters. (1)Policies on the utilizaion of atomic energy; (2)Overall adjustment of affairs relating to the utilization of atomic energy of relevant administrative government organizations; and (3)Estimation and distribution of the expenditure for the utilization of atomic energy of the relevant administrative government organizations, etc. The Prime Minister shall pay due and sufficient consideration to these decisions
Nuclear Safety Commission	This commission plans, deliberates and decides on the following matters. (1)Policies on the regulation for ensuring safety of atomic energy; and (2)Regulations on nuclear fuel materials and reactors: etc. The Prime Minister shall pay due and sufficient consideration to these decisions.
Space Activities Commission	This commission plans, deliberates and decides on the following matters, and also gives advice to the Prime Minister on the basis of its decisions. (1)Important policies on the space development; (2)Overall adjustment of affairs relating to the space development of relevant administrative government bodies, etc. The Prime Minister shall pay due consideration to these decisions.
Council for Ocean Development	This council studies and discusses basic and general matters on ocean development as required, and advises the Prime Minister on such matters.

Advisory Bodies to the Minister of State for Science and Technology

Resources Council	This council submits reports on the important matters concerning the overall utilization of resources to the STA Minister at his request.
Consulting Engineer Council	This council deliberates on the following matters. (1)Important matters on the consulting engineering system; and. (2)Granting and removal of registration of consulting engineers and assistant consulting engineers.
Council for Aeronautics, Electronics and Other Advanced Technologies	This council submits reports and gives necessary advice to the STA Minister on important matters on aeronautics, electronics and other advanced technologies.

Other Advisory Body

Radiation Council	This council submits reports at the request of heads of related administrative bodies, and gives advice on technical standards for the prevention from radiation hazards.

Outline of Institutes

National Aerospace Laboratory(NAL)

■ Objectives and Operations

NAL works to raise the level of aeronautical and space technology in Japan and is involved in the following operations.

(1) Research of advanced technology for aeronautical and space transportation

(2) Research of space transportation systems, satellite systems and space environment utilization numerical simulation techniques, and the application of aeronautical and space technology to other fields

(3) Construction and operation of large-scale research facilities for common use

■ Address, telephone number

7-44-1 Jindaiji Higashi-machi, Chofu-shi, Tokyo [illegible]

Tel 0422-47-5911

■ Date of estabishment

July 11, 1955

■ Budget for FY 1992

10,761.81 million yen

■ Number of staff members at the end of FY 1992

438

National Research Institute for Earth Science and Disaster Prevention(NIED)

■ Objectives and Operations

The institute conducts the following activities.

(1) Research on earthquake prediction, earthquake disaster prevention, prediction of [illegible] eruption, snow and ice disaster prevention, and [illegible] prevention

(2) Development of [illegible] prediction models [illegible] super computer

(3) Collection [illegible] of records and [illegible] on earth science and disaster prevention

(4) Operation [illegible] of large-scale [illegible] earthquake simulator [illegible] research

■ Address, telphone number

3-1 Tennodai, Tsukuba-shi, Ibaraki-ken, 305

Tel 0298-[illegible]

■ Date of establishment

April 1,19[illegible]

■ Budget for FY 1992

[illegible]

■ Number of staff members at the end of FY 1992

[illegible]

National Research Institute for Metals (NRIM)

■ Objectives and Operations

A general research institute on metallic materials that carries out the following works.

(1) Basic research related to development of new materials with new characteristics, with the emphasis on areas of research that are as yet undeveloped

(2) Basic research related to establishing reliability of materials

■ Address, telephone number

2-3-12, Nakameguro, Meguro-ku, Tokyo [illegible]

Tel [illegible]

■ Date of establishment

July 1, 1956

■ Budget for FY 1992

6,480.0[illegible] million yen

■ Number of staff members at the end of FY 1992

[illegible]

National Institute for Research in Inorganic Materials (NIRIM)

■ Objectives and Operations

As a national center for research in inorganic materials, NIRM promotes research to the creation of superpure nonmetallic inorganic materials and the similar materials.

■ Address, telephone number

1-1 Namiki, Tsukuba-shi, Ibaraki-ken [illegible]

Tel [illegible]

■ Date of establishment

April 1, 1966

■ Budget for FY 1992

[illegible] million yen

■ Number of staff members at the end of FY 1992

[illegible]

National Institute of Radiological Sciences (NIRS)

■ Objectives and Operations

A general research body that carries out researches related to radiology. It's operations include the following.

(1) Inverstigations and research raleted to the prevention of harm to people by radiation, over a wide range of fields including physics, biology, and medical science, etc.

(2) Investigations and research related to medical applications of radiation, including cancer treatment

(3) Training of techniciansets in relation to the two items above

■ Address,telephone number

4-9-1 Anagawa, Inage-ku, Chiba-shi, 263

Tel 043-251-2111

■ Date of establishment

July 1, 1957

■ Budget for FY 1992

11,418.61 million yen

■ Number of staff members at the end of FY 1992

[illegible]

National Institute of Science and Technology Policy (NISTEP)

■ Objectives and Operation

In order to prepare theoretical basis for appropriate and effective science and technology policy, NISTEP, as Japan's central research institute in this field, conducts systematic and quantitative analyses and studies on basic science and technology activities and of policy issues concerned.

■ Address, telephone number

1-11-39, Nagata-cho, Chiyoda-ku, Tokyo 100

Tel 03-3581-2391

■ Date of establishment

July 1, 1988

■ Budget for FY 1992

501.8 million yen

■ Number of staff members at the end of FY 1992

46

OUTLINE OF PUBLIC CORPORATIONS

Japan Atomic Energy Research Institute (JAERI)

■ **Objectives and Operations**

JAERI promotes research and other activities related to nuclear energy. To this end, JAERI conducts basic and applied research pertaining to nuclear energy, designs, constructs, and operates reactor and carries out research and development of nuclear vessels. It also disseminates information on the results obtained from such work.

■ **Address, telephone number**

2-2 Uchisaiwaicho 2 Chome
Chiyoda-ku, Tokyo 100
Tel.03-3592-2111

■ **Date of establishment**

June 15, 1956

■ **Budget for FY 1992**

114,557.73 million yen
(101,711 million yen from the Government)

■ **Number of staff members at the end of FY 1992**

2,497

Power Reactor and Nuclear Fuel Development Corporation (PNC)

■ **Objectives and Operations**

PNC is developing the fast breeder reactor and the advanced thermal reactor, technology of uranium enrichment, waste management and Pu fuel fabrication, and also is reprocessing spent nuclear fuel. Thus PNC is conducting pioneering development activities in whole areas of the nuclear fuel cycle.

■ **Address, telephone number**

1-9-13, Akasaka, Minato-ku, Tokyo 107
Tel.03-3586-3311

■ **Date of establishment**

October 2, 1967

■ **Budget for FY 1992**

210,675.01 million yen
(152,109 million yen from the Government)

■ **Number of staff members at the end of FY 1992**

2,846

Japan Information Center of Science and Technology (JICST)

■ **Objectives and Operations**

As a central organization for the advancement of science and technology in Japan, JICST constructs and provides databases in the fields of science and technology.

■ **Adress, telephone number**

5-2 Nagatacho 2 Chome,
Chiyoda-ku, Tokyo 100
Tel. 03-3581-6411

■ **Date of establishment**

August 16, 1957

■ **Budget for FY 1992**

15,635.14 million yen
(5,695 million yen from the Government)

■ **Number of staff members at the end of FY 1992**

323

National Space Development Agency of Japan (NASDA)

■ **Objectives and Operations**

NASDA develops satellites and launch vehicles for only peaceful use. It also conducts launching and tracking operations thereby contributing to Japan's space development and utilization. Its activities are carried out under the basic plan for space development authorized by the Prime Minister.

■ **Address, telephone number**

2-4-1, Hamamatsu-cho,
Minato-ku, Tokyo 105
Tel.03-5470-4111

■ **Date of establishment**

October 1, 1969

■ **Budget for FY 1992**

147,119.06 million yen
(140,789 million yen from the Government)

■ **Number of staff members at the end of FY 1992**

969

Institute of Physical and Chemical Research (RIKEN)

■ **Objectives and Operations**

It is the aim of RIKEN to create autonomous creative technologies. To this end, the institute carries out high level experimental and research work in a wide range of fields, including physics, chemistry, agricultural science, biology, and engineering extending from basic research to practical application. The institute also disseminates the results of its work to the academic and industrial worlds.

■ **Adress, telephone number**

2-1, Hirosawa, Wako-shi,
Saitama-ken 351-01
Tel.048-462-1111

■ **Date of establishment**

October 21, 1958

■ **Budget for FY 1992**

23,728.00 million yen
(21,433 million yen from the Government)

■ **Number of staff members at the end of FY 1992**

620

Japan Marine Science and Technology Center (JAMSTEC)

■ **Objectives and Operations**

JAMSTEC carries out the following activities to improve science and technology related to ocean development.

(1) Comprehensive experiments and research for the development of deep-sea exploration vessels and technology for underwater operation.
(2) Consolidation and provision of large-scale shared experiment and research facilities.
(3) Collection and provision of information and training.

■ **Address, telephone number**

2-15, Natsushima-cho,
Yokosuka-shi, Kanagawa-ken 237
Tel.0468-66-3811

■ **Date of establishment**

October 1, 1971

■ **Budget for FY 1992**

12,098.29 million yen
(11,178 million yen from the Government)

■ **Number of staff members at the end of FY 1992**

163

Research Development Corporation of Japan (JRDC)

■ **Objectives and Operations**

The objective of JRDC is to develop new technology, foster the creation of advanced technology, disseminate the results obtained, and to promote international research exchanges.

(1) Contracted development of new technology
(2) Basic research for fostering the creation of advanced technologies and advancing future interdisciplinary scientific activities including International Joint Research Program
(3) Dissemination of results obtained from (1) and (2)
(4) Coordination for Licensing
(5) International exchanges of researchers
(6) Information on research activities

■ **Address, telephone number**

5-2 Nagata-cho 2 chome,
Chiyoda-ku, Tokyo 100
Tel.03-3507-3001

■ **Date of establishment**

July 1, 1961

■ **Budget for FY 1992**

17,105.31 million yen
(12,163.13 million yen from teh Government)

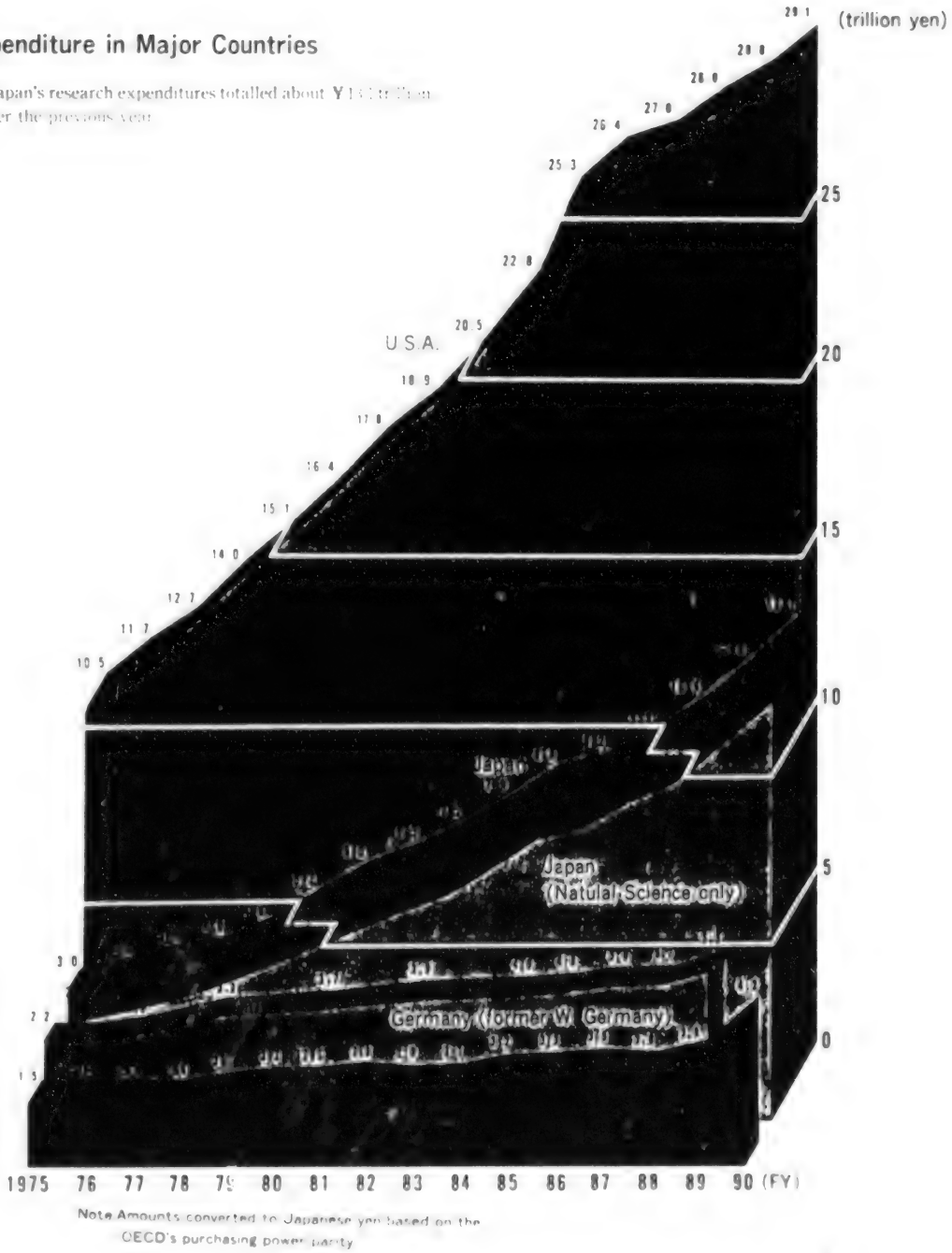
■ **Number of staff members at the end of FY 1992**

90

Research and Development Activities in Major Countries

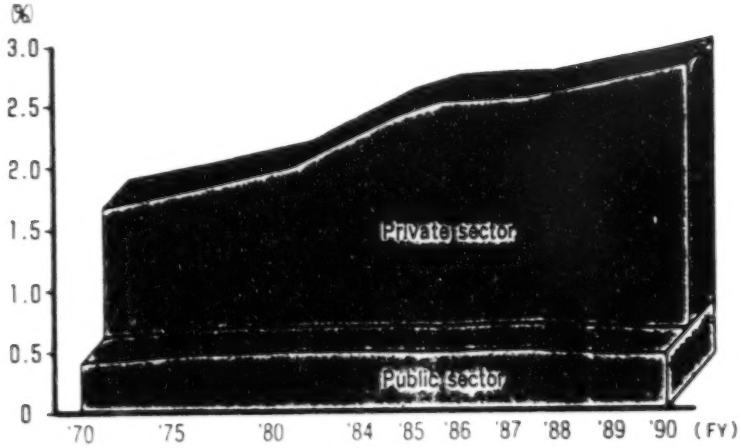
R&D Expenditure in Major Countries

In FY1990, Japan's research expenditures totalled about ¥[illegible] trillion, up 10.7% over the previous year.



Note Amounts converted to Japanese yen based on the OECD's purchasing power parity

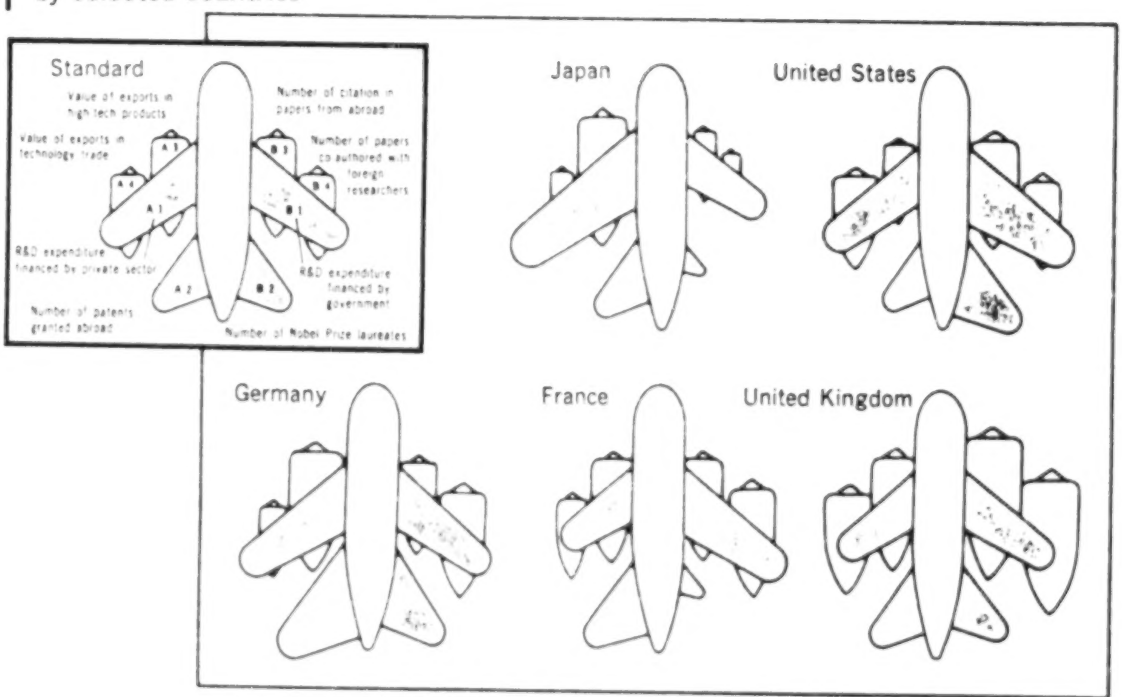
Trends in Ratio of R&D Expenditures in GNP (by sector)



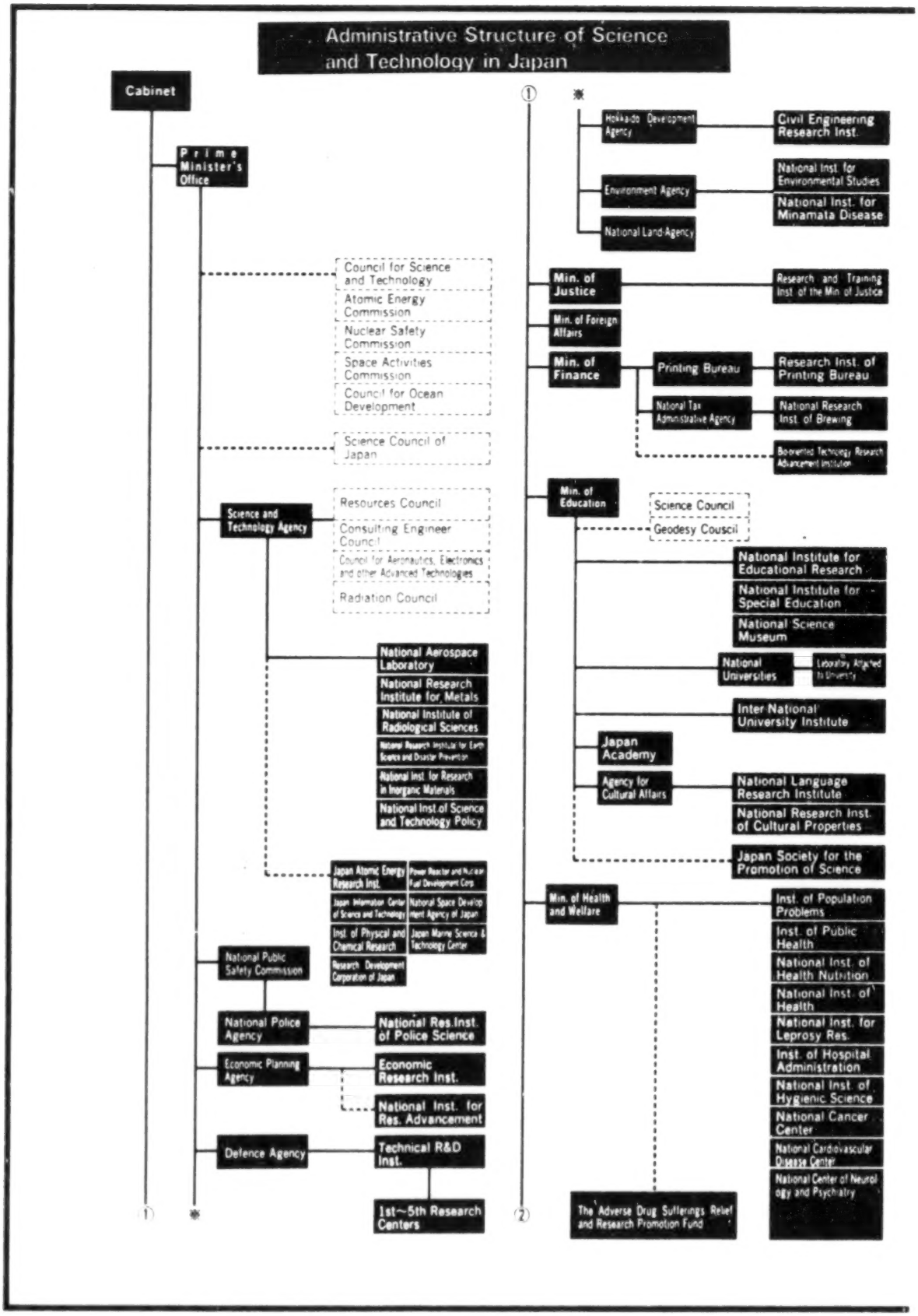
R&D Expenditures (Natural Science only)

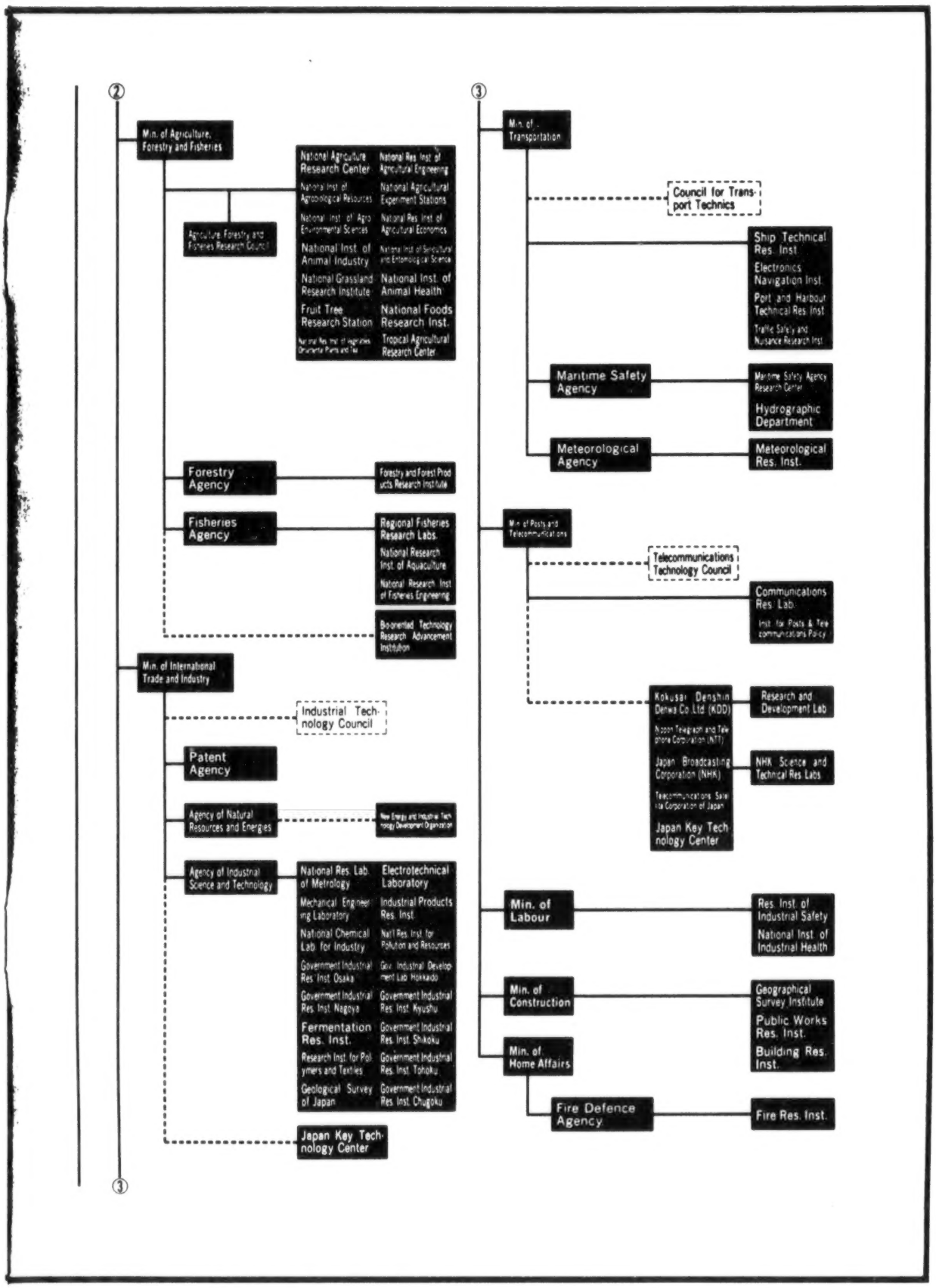
While industry has been boosting Japan's outlays for R&D to 2.8% of GNP in 1990, government expenditure has remained at 0.5% of GNP for the past 10 years.

Comparison of science and technology activities by selected countries



Notes) 1. Each figure indicates relevant countries' scales in science and technology activities compared with its national power (GNP).
("Standard" figure indicates the normal form (in area) when one country has equal ratio of scale in relevant science and technology activities to its national power.)
2. A1 R&D expenditure financed by private sector (1989)
A2 Number of patents granted abroad (1987)
A3 Value of exports in high-tech products (1986)
A4 Value of exports in technology trade (1988)
B1 R&D expenditure financed by goverment (1989)
B2 Number of Nobel prize laureates (1981~1990)
B3 Number of citation (1984~86) in papers (published during 1981~86) from abroad
B4 Number of papers co-authored with foreign researchers (1981~85)


Administrative Structure of Science and Technology in Japan
Cabinet
Prime Minister's Office
Council for Science and Technology
Atomic Energy Commission
Nuclear Safety Commission
Space Activities Commission
Council for Ocean Development
Science Council of Japan
Science and Technology Agency
Resources Council
Consulting Engineer Council
Council for Aeronautics, Electronics and other Advanced Technologies
Radiation Council
National Aerospace Laboratory
National Research Institute for Metals
National Institute of Radiological Sciences
National Research Institute for Earth Science and Disaster Prevention
National Inst. for Research in Inorganic Materials
National Inst.of Science and Technology Policy
Japan Atomic Energy Research Inst.
Power Reactor and Nuclear Fuel Development Corp.
Japan Information Center of Science and Technology
National Space Development Agency of Japan
Inst. of Physical and Chemical Research
Japan Marine Science & Technology Center
Research Development Corporation of Japan
National Public Safety Commission
National Police Agency
National Res.Inst. of Police Science
Economic Planning Agency
Economic Research Inst.
National Inst. for Res. Advancement
Defence Agency
Technical R&D Inst.
1st~5th Research Centers
Hokkaido Development Agency
Civil Engineering Research Inst.
Environment Agency
National Inst. for Environmental Studies
National Inst. for Minamata Disease
National Land Agency
Min. of Justice
Research and Training Inst. of the Min. of Justice
Min. of Foreign Affairs
Min. of Finance
Printing Bureau
Research Inst. of Printing Bureau
National Tax Administrative Agency
National Research Inst. of Brewing
Min. of Education
Science Council
Geodesy Council
National Institute for Educational Research
National Institute for Special Education
National Science Museum
National Universities
Inter National University Institute
Japan Academy
Agency for Cultural Affairs
National Language Research Institute
National Research Inst. of Cultural Properties
Japan Society for the Promotion of Science
Min. of Health and Welfare
Inst. of Population Problems
Inst. of Public Health
National Inst. of Health Nutrition
National Inst. of Health
National Inst. for Leprosy Res.
Inst. of Hospital Administration
National Inst. of Hygienic Science
National Cancer Center
National Cardiovascular Disease Center
National Center of Neurology and Psychiatry
The Adverse Drug Sufferings Relief and Research Promotion Fund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Min. of Agriculture, Forestry and Fisheries
National Agriculture Research Center
National Res. Inst. of Agricultural Engineering
National Inst. of Agrobiological Resources
National Agricultural Experiment Stations
National Inst. of Agro-Environmental Sciences
National Res. Inst. of Agricultural Economics
National Inst. of Animal Industry
National Inst. of Agricultural and Entomological Science
National Grassland Research Institute
National Inst. of Animal Health
Fruit Tree Research Station
National Foods Research Inst.
National Res. Inst. of Vegetables, Ornamental Plants and Tea
Tropical Agricultural Research Center
Agriculture, Forestry and Fisheries Research Council
Forestry Agency
Forestry and Forest Products Research Institute
Fisheries Agency
Regional Fisheries Research Labs.
National Research Inst. of Aquaculture
National Research Inst. of Fisheries Engineering
Bio-oriented Technology Research Advancement Institution
Min. of International Trade and Industry
Industrial Technology Council
Patent Agency
Agency of Natural Resources and Energies
New Energy and Industrial Technology Development Organization
Agency of Industrial Science and Technology
National Res. Lab. of Metrology
Electrotechnical Laboratory
Mechanical Engineering Laboratory
Industrial Products Res. Inst.
National Chemical Lab. for Industry
Nat'l Res. Inst. for Pollution and Resources
Government Industrial Res. Inst. Osaka
Gov. Industrial Development Lab. Hokkaido
Government Industrial Res. Inst. Nagoya
Government Industrial Res. Inst. Kyushu
Fermentation Res. Inst.
Government Industrial Res. Inst. Shikoku
Research Inst. for Polymers and Textiles
Government Industrial Res. Inst. Tohoku
Geological Survey of Japan
Government Industrial Res. Inst. Chugoku
Japan Key Technology Center
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Min. of Transportation
Council for Transport Technics
Ship Technical Res. Inst.
Electronics Navigation Inst.
Port and Harbour Technical Res. Inst.
Traffic Safety and Nuisance Research Inst.
Maritime Safety Agency
Maritime Safety Agency Research Center
Hydrographic Department
Meteorological Agency
Meteorological Res. Inst.
Min. of Posts and Telecommunications
Telecommunications Technology Council
Communications Res. Lab.
Inst. for Posts & Telecommunications Policy
Kokusai Denshin Denwa Co. Ltd. (KDD)
Research and Development Lab.
Nippon Telegraph and Telephone Corporation (NTT)
Japan Broadcasting Corporation (NHK)
NHK Science and Technical Res. Labs.
Telecommunications Satellite Corporation of Japan
Japan Key Technology Center
Min. of Labour
Res. Inst. of Industrial Safety
National Inst. of Industrial Health
Min. of Construction
Geographical Survey Institute
Public Works Res. Inst.
Building Res. Inst.
Min. of Home Affairs
Fire Defence Agency
Fire Res. Inst.
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